HORTICULTURAL ABSTRACTS

Vol. XXXI September 1961 No. 3

Initialled reviews not by Bureau staff are by T. N. Hoblyn of the East Malling Research Station, E. E. Cheesman of the Agricultural Research Council, G. F. Sheard of the Glasshouse Crops Research Institute, Littlehampton, F. W. Shepherd of the Rosewarne Experimental Horticulture Station, Camborne, Cornwall, D. Akenhead and G. St. C. Feilden.

In addition, many of the abstracts of Australian papers have been prepared by members of the C.S.I.R.O. staff in Melbourne.

INDEX OF CONTENTS

MISCELLANEOUS Nos.
Abstr. 165. Noted 42 3616-3822
General 3616-3621
Climate and air pollution 3622-3625
Seeds 3626-3631
Propagation 3632-3636
Soils, soil management and composts 3637-3642
Water and irrigation 3643-3653
Nutrition 3654-3660
Radioactive contamination 3661-3666
Soilless culture 3667-3668
Tissue culture 3669
Physiology and metabolism 3670-3700
Growth substances 3701-3722
Pollen and nectar 3723-3725
Packing, storage and marketing 3726-3733
Herbicides and weed control 3734-3750
Plant protection 3751-3776
Chemical residues and their analysis 3777-3779
Experimental techniques 3780-3798
Practical and research equipment 3799-3814
Greenhouses, frames and cloches 3815-3822

TEMPERATE TREE FRUITS
Abstr. 183. Noted 41 3823-4046
General 3823-3834
Breeding and varieties 3835-3855
Propagation and rootstocks 3856-3892
Climatic factors 3893-3906
Soil management and irrigation 3907-3926
Nutrition and tree composition 3927-3949
Growth and physiology 3950-3961
Planting, training and pruning 3962-3974
Pollination and fruit set 3975-3989
Fruit thinning and development 3990-3995
Fruit composition and quality 3996-4001
Harvesting, handling and marketing 4002-4024
Storage 4025-4046

SMALL FRUITS, VINES AND NUTS
Abstr. 118. Noted 28 4047-4192
Strawberries 4047-4066
Other small fruits 4067-4096
Vines—general 4097-4104
Vines—breeding and varieties 4105-4113
Vines—propagation and rootstocks 4114-4129
Vines—climate and forcing 4130-4134
Nos.
Vines—growth, physiology and reproduction 4135-4146
Vines—planting, training and pruning 4147-4152
Vines—soil management, irrigation and nutrition 4153-4173
Vines—grape composition and quality 4174-4180
Vines—packing, handling and storage 4181-4185
Temperate nuts 4186-4192

PLANT PROTECTION OF TEMPERATE FRUITS
Abstr. 129. Noted 23 4193-4344
General 4193-4198
Disorders of uncertain origin 4199-4200
Viruses 4201-4216
Bacteria 4217-4220
Fungi 4221-4260
Nematodes 4261-4262
Mites 4263-4273
Insect pests 4274-4324
Other pests 4325-4328
Chemicals and their application 4329-4344

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE
Abstr. 298. Noted 54 4345-4696
General 4345-4380
Artichokes 4381-4382
Asparagus 4383-4386
Brassicas 4387-4414
Celery and celeriac 4415-4421
Cucurbits 4422-4449
Legumes—beans 4450-4491
Legumes—peas 4492-4511
Lettuce and other salad crops 4512-4531
Mushrooms—general 4532-4538
Mushrooms—strains and other edible fungi 4539-4545
Mushrooms—spawn and spawning methods 4546-4550
Mushrooms—composts and casing materials 4551-4560
Mushrooms—growth and environment 4561-4565

Nos.
Mushrooms—disorders, diseases and pests 4566-4576
Mushrooms—harvesting and composition 4577-4582
Onions and related crops 4583-4610
Rhubarb 4611
Root crops 4612-4619
Spinach 4620-4622
Sweet and red peppers and eggplants 4623-4635
Tomatoes—general 4636-4640
Tomatoes—breeding and varieties .. 4641-4655
Tomatoes—environment, growth and physiology 4656-4667
Tomatoes—soil management, irrigation and nutrition 4668-4675
Tomatoes—diseases and pests .. 4676-4691
Tomatoes—fruit quality and composition 4692-4694
Sundry crops 4695-4696

TOBACCO
Abstr. 87. Noted 24 4697-4807
General 4697-4703
Breeding and varieties 4704-4720
Seeds and seed-beds 4721-4730
Planting and cultivation 4731-4738
Climate and irrigation 4739-4743
Soils, nutrition and mineral composition 4744-4755
Growth, reproduction and desuckering 4756-4762
Physiology and biochemistry .. 4763-4774
Disorders, diseases and pests .. 4775-4796
Harvesting, processing and quality .. 4797-4807

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS
Abstr. 96. Noted 46 4808-4949
Condiment and spice plants 4808-4815
Drug plants 4816-4858
Essential oils 4859-4878
Fibres 4879-4892
Hops 4893-4922
Insecticidal plants 4923-4926
Rubber plants 4927
Seed oils 4928-4944
Sugar maples 4945-4946
Sundry plants 4947-4949

FLORICULTURE
Abstr. 114. Noted 52 4950-5115
General 4950-4973
Annual and herbaceous plants .. 4974-5019
Bulbs, tubers, etc. 5020-5052
Lawns and sports turf 5053-5060
Foliage and succulent plants .. 5061-5066
Orchids 5067-5070
Roses 5071-5077
Other trees and shrubs 5078-5115

Nos.
SUB-TROPICAL FRUIT AND PLANTATION CROPS
Abstr. 104. Noted 31 5116-5250
Avocadoes 5116-5121
Carobs 5122
Citrus—varieties, propagation and rootstocks 5123-5135
Citrus—climatic and other environmental factors 5136-5142
Citrus—soil management, nutrition and mineral composition 5143-5160
Citrus—growth, reproduction and physiology 5161-5168
Citrus—diseases 5169-5178
Citrus—pests 5179-5203
Citrus—fruit harvesting, packing and storage 5204-5213
Citrus—fruit composition and byproducts 5214-5218
Dates 5219-5221
Litchis 5222-5223
Olives 5224-5240
Passion fruit 5241-5243
Persimmons 5244-5245
Pomegranates 5246-5247
Prickly pears 5248
Tung 5249-5250

TROPICAL FRUIT AND PLANTATION CROPS
Abstr. 234. Noted 66 5251-5550
General 5251-5261
Areca palms 5262-5264
Bananas 5265-5281
Cacao 5282-5296
Cashews 5297-5300
Coconuts 5301-5314
Coffee—general 5315-5318
Coffee—varieties, propagation and planting 5319-5326
Coffee—climate, growth phenomena and culture 5327-534
Coffee—disorders, diseases and pests 5342-5353
Coffee—processing and composition 5354-5357
Guavas 5358-5362
Mangoes 5363-5377
Oil palms 5378-5383
Papaws 5384-5391
Pineapples 5392-5400
Rubber trees 5401-5412
Sugar cane—general 5413-5419
Sugar cane—breeding, flowering and varieties 5420-5436
Sugar cane—planting, growth, climate and irrigation 5437-5442
Sugar cane—soil management and weed control 5443-5458
Sugar cane—nutrition 5459-5477
Sugar cane—diseases 5478-5497

INDEX OF CONTENTS—*continued*

Nos.
Sugar cane—pests 5498-5515
Sugar cane—yields, harvesting, composition and by-products 5516-5527
Tea—propagation and culture .. 5528-5537
Tea—diseases and pests 5538-5543
Tea—quality and composition .. 5544-5546
Sundry crops 5547-5550

Nos.
NOTES ON BOOKS AND REPORTS Abstr. 41. Noted 4 5551-5595
Books 5551-5565
Annuals and reports 5566-5593
New periodicals 5594-5595

Total Abstracts 1569. Noted 411.

TRANSLATIONS AVAILABLE

Listed below are the translations completed since the first annual list was published in *H.A.*, Vol. 30, No. 3. The list is divided into two groups, the first consisting of new translations not advertised previously, and the second repeating translations previously advertised on blue forms inserted loose in the last three numbers of *H.A.*

Readers who wish to obtain translations are asked to send in their orders as early as possible, because the number of copies available of each translation is not large. These orders should be sent direct to this Bureau [**NOT** to C.A.B., Farnham Royal], merely quoting the reference number and, in so far as red tape permits, enclosing the appropriate sum of money.

Seventh Quarterly List

Reference No.	*Title*	*Price*	*Abstract in Horticultural Abstracts*
Q.F. 3950	BLASSE, W. The influence of various methods of soil management on soil moisture trends in orchards, 1958 and 1959. [German.] *Dtsch. Gartenb.*, 1960, **7**: 102-5, illus.	8s.	Vol. 30, No. 4884
N.I.A.E. 105	BORN, M., JENSKE, A., and ERMICH, E. F. Comparative investigations into the possibilities of using different methods of pest control in hop cultures. [German.] *NachrBl. dtsch. PflSchDienst, Berlin*, 1960, **14**: 253-8.	1s. 9d.	Vol. 31(4), in preparation
Q.F. 4023a	CANISIUS, J. J. The change from bush form to free spindle. [Dutch.] *Fruitteelt*, 1955, **45**: 932-3, 937, illus.	6s.	Vol. 26, No. 181
Q.F. 4025	CHVOJKA, L., VEREŠ, K., and KOZEL, J. The effect of kinins on the growth of apple-tree buds and on incorporation of radio-active phosphate. [Russian.] *Biol. plant., Prague*, 1961, **3**(2): 140-7.	16s.	Vol. 31(4), in preparation
Q.F. 3880a	EVENHUIS, H. H., MULDER, D., and PFAELTZER, H. J. The transmission of "rozetziekte" (rosette disease), a virus disease of cherry. [Dutch.] *Tijdschr. PlZiekt.*, 1959, **65**: 122-7, bibl. 7, illus.	10s.	Vol. 30, No. 397
Q.F. 4026	GERMING, G. H. Black plastic as a soil cover for strawberries. [Dutch.] *Meded. Dir. Tuinb.*, 1960, **23**: 750-4, bibl. 6, illus.	5s.	Vol. 31, No. 2098
Q.F. 3880c	JORDOVIĆ, M. On some little-known viruses of fruit trees in Yugoslavia. [Yugoslav.] *Zašt. Bilja*, 1958, No. 47/48, pp. 109-11, illus.	7s. 6d.	Vol. 30, No. 393

Reference No.	*Title*	*Price*	*Abstract in Horticultural Abstracts*
Q.F. 3880b	JOVIĆEVIĆ, B. Some observations on "Prunus Virus 7" in the Kosovo-Metohija province. [Yugoslav.] *Zašt. Bilja*, 1958, No. 46, pp. 17-25.	20s.	Vol. 30, No. 398
Q.F. 4021	LANGEDIJK, G. J., and VEERMAN, J. A. Bulb lifting machines. [Dutch.] *Weekbl. BloembollCult.*, 1960, **71**: 1-4, illus.	6s.	Vol. 31, No. 1110
D.S.I.R. RTS 1746	RITSLAID, V. The effect of aero ionization on the germination of seeds and growth of plants. [Estonian.] *Izv. Akad. Nauk EstSSR, Ser. biol.*, 1960, (2), pp. 167-76.	25s.	Vol. 31, No. 21
Q.F. 3978	SÁGI, F., and others. A contribution to the identification and chemotaxonomy of *Fragaria*, *Grossularia*, *Ribes* and *Rubus* species and varieties. [Hungarian.] *Kísérl. Közlem., Sect. K*, 1959, **52C**(3): 19-28, bibl. 19.	20s.	Vol. 31, No. 393
Q.F. 4009	SPENDER, B. The overwintering of vegetable seedlings for the 1959 season. [German.] *Dtsch. Gartenb.*, 1958, **9**: 229-33, bibl. 9, illus.	8s.	Vol. 29, No. 520
Q.F. 4023b	VAN STUIVENBERG, J. H. M. Why will the head [of spindle-bush apple trees] not grow on? [Dutch.] *Fruitteelt*, 1959, **49**: 12-13, illus.	4s.	Vol. 29, No. 1140
	Translations previously shown on 4th, 5th and 6th Quarterly Lists		
Q.F. 3807	AHLBERG, O. The currant gall mite. [Swedish.] *Växtskyddsnotiser*, 1951, **15**: 26-9, illus.	4s. 6d.	Vol. 22, No. 2373
Q.F. 3857	ALVIM, P. DE T. A simple method of conserving the germinating power of cacao seeds. [Spanish.] *Agronomía, Peru*, 1958, **25**(92): 43-8.	7s. 6d.	Vol. 30, No. 2826
Q.F. 3779c	ANON. The use of the dew recorder in plant protection. [Italian.] *Inf. fitopat.*, 1959, **9**: 300, illus.	2s.	Vol. 30, No. 1933
Q.F. 3885	BOEREMA, G. H., and SILVER, C. N. Downy mildew of anemones. [Dutch.] *Meded. PlZiekt. Dienst* **134**, 1960, pp. 155-7, bibl. 6.	3s.	Vol. 31, No. 2925
Q.F. 3837	BÖMEKE, H. How can the natural laws governing the development of the scab fungus be utilized for the warning service? [German.] *Mitt. biol. Bundesanst. Berlin-Dahlem*, 1959, No. 97, pp. 163-6, bibl. 2.	6s.	Vol. 30, No. 3557
Q.F. 3787a	CALZECCHI-ONESTI, F. Hydroponic culture is something to be taken seriously. [Italian.] *Ital. agric.*, 1960, **97**: 57-65, bibl. 27, illus.	9s.	Vol. 30, No. 1537

Reference No.	*Title*	*Price*	*Abstract in Horticultural Abstracts*
Q.F. 3871	DECKER, H. *Pratylenchus penetrans* as the cause of soil sickness in tree nurseries of the German Democratic Republic. [German.] *Nematologica*, 1960, Suppl. II: 68-75, bibl. 10, illus.	12s.	Vol. 31, No. 528
Q.F. 3787c	FAVILLI, R. Technical and economic aspects of hydroponic crop growing. [Italian.] *Riv. Ortoflorofruttic. ital.*, 1959, **43**: 199-217, illus.	25s.	Vol. 31, No. 2558
Q.F. 3873	FRANSSEN, C. J. H. The life history and possible means of controlling of *Enarmonia nigricana.* [Dutch.] *Meded. PlZiekt. Dienst* **70**, 1954, pp. 50, bibl. 38, illus.	30s.	Vol. 24, No. 3853
Q.F. 3936	GEISSLER, T., and GÖHLER, F. Comparative experiments lasting five years on soilless culture of vegetables under glass in water and gravel culture systems. [German.] *Arch. Gartenb.*, 1959, **7**: 416-23, bibl. 6, illus.	10s.	Vol. 30, No. 5342
Q.F. 3837a	GERRITSEN, J. D. Telephone warning service for fruit culture. [Dutch.] *Meded. Dir. Tuinb.*, 1959, **22**: 617-19, illus.	4s.	Vol. 30, No. 3558
Q.F. 3907	GÖHLER, F. The concentration of nutrient solutions for the soilless culture of tomatoes under glass. [German.] *Arch. Gartenb.*, 1960, **8**: 130-45, bibl. 5, illus.	21s.	Vol. 30, No. 5595
Q.F. 3935	GÖHLER, F. The removal of nutrients and their utilization in the soilless culture of cucumbers and tomatoes under glass. [German.] *Arch. Gartenb.*, 1960, **8**: 146-60, bibl. 13.	21s.	Vol. 30, No. 5343
N.I.A.E. 94	GORDON, M. Peat to simplify and improve the culture of pot plants. [German.] *Dtsch. Gartenb.*, 1955, **2**: 239-40, illus.	1s. 9d.	Vol. 26, No. 112
Q.F. 3788	GROENEWEGEN, J. H. The grafting of cucumbers and melons. [Dutch.] *Meded. Dir. Tuinb.*, 1953, **16**: 169-83, bibl. 10, illus.	17s. 6d.	Vol. 23, No. 3062
Q.F. 3823	LUC, M. Nematodes and "Kaincopé disease" of coconut palms. [French.] *Oléagineux*, 1957, **12**: 691-3, bibl. 6.	6s.	Vol. 28, No. 868
Q.F. 3870	MARCELLI, E. The action of new fungicides based on nitro-derivatives of phenol on powdery mildew (of tobacco). [Italian.] *Tabacco*, 1960, **64**: 74-9, bibl. 3.	5s.	Vol. 31, No. 906
Q.F. 3875	MARRO, M. Growing black-currants. [Italian.] *Frutticoltura*, 1959, **21**: 463-72, bibl. 6, illus.	10s.	Vol. 30, No. 317

Reference No.	*Title*	*Price*	*Abstract in Horticultural Abstracts*
D.S.I.R. RTS 1456	OSELEDETS, N. N. The effect of chlorides and sulphates on the growth and development of tobacco seedlings. [Russian.] *Tabak*, 1956, **17**(4): 53-5.	5s.	Vol. 27, No. 2566
N.I.A.E. 93	PENNINGSFELD, F. Manuring of plot plants by sub-irrigation. [German.] *Gartenwelt*, 1951, **51**: 133-5, 169, illus.	3s. 6d.	Vol. 23, No. 3749
Q.F. 3876	PIVA, V. Black-currants. [Italian.] *Progr. agric.*, 1959, **5**: 921-5, illus.	12s. 6d.	Vol. 30, No. 318
Q.F. 3915	RAUTAVAARA, T. Should we try new methods in strawberry growing? [Finnish.] *Puutarha*, 1958, **61**: 368-9, illus.	3s.	Vol. 29, No. 3329
N.I.A.E. 92	SCHUPP, F. Experiences with sub-irrigation of pot plants. [German.] *Gartenwelt*, 1956, **56**: 217-18, illus.	2s.	Vol. 26, No. 3954
Q.F. 3787b	SPIRIDONOVA, A. I., and VAŠČENKO, S. F. Cultivating cucumbers and tomatoes on artificial media. [Russian.] *Sad i Ogorod*, 1959, No. 9, pp. 23-9.	10s.	Vol. 30, No. 2180
Q.F. 3904a	STRIJBOSCH, T. The classification of soil suitability for crops under glass. [Dutch.] *Meded. Dir. Tuinb.*, 1960, **23**: 215-17, illus.	3s.	Vol. 30, No. 4678
Q.F. 3904b	STRIJBOSCH, T. Soil classification for vegetable crops under heated glass. [Dutch.] *Meded. Dir. Tuinb.*, 1960, **23**: 286-94, illus.	12s.	Vol. 30, No. 4678
D.S.I.R. RTS 1679	TIKHOMIROV, B. A. Data on the economic plants of the Eskimoes of the south-eastern Chukotka coast. [Russian.] *Bot. Zhurnal*, 1958, **43**(2): 242-6.	10s.	Vol. 28, No. 3229
Q.F. 3833	VAN DE VRIE, M. Biology and control of the tarsonemid mite in strawberries. [Dutch.] *Meded. Dir. Tuinb.*, 1957, **20**: 433-8, bibl. 15.	9s.	Vol. 28, No. 302
Q.F. 3903	VOLZ, H. Studies on the incidence of mechanical soil compaction in orchards and its effects on the root growth of bush apple trees. [German.] *Inaug. Dissert. Rhein. Friedrich Wilhelms-Univ., Bonn*, 1959, pp. 66, bibl. 50, illus.	25s.	Vol. 30, No. 1682
Q.F. 3812	ZILLER, R. A study of certain factors influencing the copra content of coconuts. [French.] *Oléagineux*, 1960, **15**: 73-81, bibl. 14, illus.	18s.	Vol. 30, No. 2857

MISCELLANEOUS.

General.

3616. Imola, Cassa di Risparmio, Centro Studi.
Convegno di studio sulla riconversione della agricoltura collinare romagnola. Imola, 1960. **(Proceedings of a study conference on the reconversion of agriculture in the hill region of Romagna. Imola, 1960)**, pp. 42.

The 4 papers included are: Inquiry on agriculture in the Imola region, by members of the Study Centre; Prospects of development for vegetable and fruit growing in the Imola region, by E. Baldini; Viticulture in the hills of Romagna, and some of its current problems, by C. Capucci; Plant protection problems in vegetable and fruit crops in the hills of Imola, by S. Foschi.

3617. Buishand, T., and others.
Indrukken van de tuinbouw in Zuidwest-Duitsland. **(Impressions of horticulture in south-west Germany.)** [English and German summaries 1 p. each.]
Meded. Proefst. Groent. Volle Grond Ned., Alkmaar **17**, 1960, pp. 48, bibl. 8, illus.

A study tour of the vegetable growing area.

3618. El Barkouki, M.
Frutticoltura, viticoltura e olivicoltura in Egitto. **(Growing fruit, vines and olives in Egypt.)**
Inf. Ortofruttic., 1960, **1**: 168-9.

The areas under citrus, vines, mangoes, bananas, olives, dates and stone-fruits are quoted, and the principal varieties of citrus, vines and olives are briefly described.

3619. Aristeguieta, L.
El Instituto y el Jardín Botánicos se complementan. **(The [Venezuelan] Botanical Institute and Botanic Gardens are complementary.)**
Agric. venezol., 1960, **24**(218): 24-6, illus.

The Botanical Institute at Caracas University conducts botanical investigations and is responsible for the Venezuelan Herbarium, which contains about 100,000 specimens covering about 18,000 Venezuelan species. The Botanic Gardens of 70 ha. has 7 sections, viz. succulents, palmetum, tropical house, arboretum, economic botany, nursery and aquatic plants.

3620. Slits, H. J. A.
De opbrengst en de kosten van een teelt. **(Yield and cost of a crop.)** [English summary 8 lines.]
Meded. Dir. Tuinb., 1961, **24**: 118-19, summary 142.

An attempt is made to equate nett proceeds with crop yield, price and cost. Equations are given for both constant and fluctuating prices and costs.

3621. Fjäderhane, A. M., and Arvidsson, L.
Arbetsstudier i trädgårdsodlingen. **(Work studies in horticulture.)**
Medd. Alnarpsinst. trädgårdsekon. Byrån, **34**, [1960], pp. 54, illus.

The time taken in various horticultural operations has been recorded, with notes on whether the work was piece-work or by contract and the type of worker (male or female, and degree of skill). The operations studied include: taking and potting cuttings of *Ficus elastica*, *Gardenia floribunda* and poinsettia; potting young plants of saintpaulia, cyclamen, begonia and hydrangea; planting, topping and disbudding chrysanthemums; wiring, disbudding and picking carnations; tying up nursery stock of hawthorn, pear and plum; harvesting (or picking) *Adiantum*, cucumbers, raspberries, peas, dill, carnations, beetroot, black currants and tomatoes; grass cutting; hedge trimming; cleaning of *Adiantum*; weeding dill; pruning cucumbers and melons; and landscape construction.

Climate and air pollution.

(*See also* 3809, 4467, 4658, 5136.)

3622. Wadsworth, R. M.
The effect of artificial wind on the growth-rate of plants in water culture.
Ann. Bot., Lond., 1960, **24**: 200-11, bibl. 21, illus.

Young plants of several species, including pea, growing in water culture were exposed in a wind tunnel to continuous wind speeds of 0·3, 0·7, 1·7 and 4·0 m. per sec. for 4 to 5 days. Natural daylight, humidity and temperature were maintained. No significant change in the relative growth rate or net assimilation rate was found. [From author's abstract.]—Univ. Reading.

3623. Sakai, A.
Relation of sugars and polyhydric alcohols to frost-hardiness in woody plants. [Japanese.]
J. Jap. For. Soc., 1960, **42**: 373-8, illus., from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 15093.

Changes in the sugar and polyhydric alcohol contents of the leaves and cortex of the branches of 19 woody species, including tea, pomegranate and *Malus pumila*, with season and with artificial low temperature treatment were studied using paper chromatography. There was little difference in the kind of sugar found in the various species or at the different seasons, except in the case of raffinose and stachyose. In winter the sugars found were sucrose, glucose, fructose, maltose, raffinose, stachyose and galactose. The ratios of the various sugars differed with the species and there was no general relationship between this ratio and frost hardiness. When exposed to low temperatures the total sugars content increased by 50–110%, depending upon the species. Raffinose and stachyose were only found in larger quantities in the dormant season. In winter the mannitol and sorbitol contents increased by 2 to 3 times in most of the species tested, 0·1 to 0·5% mannitol, by green weight, being found in most species, and 1% sorbitol in the pomegranate. In most of the species the total polyhydric alcohol content in winter was usually less than 10% of the total sugars content, but in the pomegranate and *Malus pumila* it was 30 to 50%. On exposure to low temperatures the increase in the polyhydric alcohol content was less than 0·1% in most cases, whereas sugars increased by 1·0 to 1·6%. Frost hardiness did not show any relationship to the polyhydric alcohol content, and it is concluded that in most of the species tested the polyhydric alcohols do not contribute to frost hardiness.—Hokkaido Univ., Sapporo.

3624. PITTMAN, S.
Pollution, parks and plane trees.
Park Administ., 1961, **26**: 22-6, bibl. 5.

A discussion on the nature, distribution and effects on plant growth of atmospheric pollution, the selection of suitable planting material, including a list of tolerant species, and the maintenance of plants in glasshouses in polluted areas.

3625. MULDER, W. J., AND DEN BOER, W.
Beschadiging aan tuinbouwgewassen door fabrieksdampen. (**Injury to horticultural crops by factory fumes.**) [English summary ¼ p.]
Meded. Dir. Tuinb., 1961, **24**: 95-107, summary 141-2, bibl. 13, illus.

Leaf-scorch injury was observed on horticultural crops in the neighbourhood of a superphosphate factory. Similar symptoms were artificially induced in an atmosphere containing high F levels. Gladioli showing natural symptoms were found by analysis to contain toxic amounts of F.—R.T.C., The Hague.

Seeds.

(*See also* 3709, 3713, 3849, 3857, 4350, 4352, 4353, 4426, 4427, 4457-4459, 4490, 4499, 4514-4520, 4581, 4582, 4613, 4660, 4722-4726, 4927, 4954, 4955, 5061, 5080, 5112, 5227, 5321, 5323.)

3626. MAYER, A. M.
Germination research at the Hebrew University, Jerusalem, Israel—a review.
Indian J. Plant Physiol., 1960, **3**: 13-23, bibl. 80.

A brief review of work on radiation, germination inhibitors and stimulators, growth stimulators, gas exchange of seeds, the biochemistry of germination and the ecological factors affecting germination.

3627. NIKOLAEVA, M. G., AND KATKEVIČ, JU. JU.
The effect of temperature on the respiration of dormant seeds. [Russian, with English summary ½ p.]
Fiziol. Rast., 1961, **8**: 42-50, bibl. 21.

The respiration of dormant seeds of *Acer tataricum* and *Euonymus europaea* was greatly depressed by low temperatures but remained strictly aerobic. It is suggested that this type of respiration favours the accumulation of metabolites necessary for germination. A temporary rise in the respiration rate and respiratory quotient of partially stratified seeds when these are transferred to a higher temperature (25° C.) results in the consumption of these metabolites and leads to an induced secondary dormancy.

3628. SPREAFICO, L.
Metodo biochimico "topografico" o del tetrazolio per determinare la vitalità dei semi. (**The "topographical" biochemical or tetrazolium method of testing the viability of seeds.**) [English and German summaries 8 lines each.]
Sementi elette, 1960, **6**(4): 24-35, bibl. 13, illus.

Notes are given on tests by the Lakon method [see also *H.A.*, 29: 2031] on seeds of various species, including beans, peas, *Prunus cerasifera* and pears.

3629. SHACKELFORD, J., AND BOX, C. O.
New concentrate tested on seed and woody plants.
Miss. Fm Res., 1960, **23**(6): 8.

Activite concentrate is a product of manure from lactating cows which has been fermented in water and inoculated with organisms originally extracted from the sea. Soaking tomato seed in a dilution of the concentrate for 24 hr. hastened germination, but soaking for 48 hr. inhibited it. No beneficial rooting effects resulted from soaking cuttings of *Euonymus* and *Feijoa* in a solution of the concentrate.

3630. VERONA, O.
Influenza delle sostanze mucillagginose presenti nella parte esterna di alcuni semi sulla spermosfera. (**Effect on the "spermosphere" of the mucilaginous substances present on the surface of certain seeds.**) [French summary 4 lines.]
Ann. Fac. Agr. Pisa, 1958, **19**: 51-3, bibl. 3, illus.

The mucilaginous outer layer of certain seeds, e.g. Cruciferae, is considered to have the following effects in the area of soil surrounding the germinating seed: (1) flocculation of clay, (2) protection against pathogens by microbial agglutination, (3) an increase in the number of degrading bacteria, (4) a possible increase in N-fixing microflora, and (5) the possible microbial formation of acids and dissolving of insoluble mineral compounds.—Ist. Pat. veg., Univ. Pisa.

3631. HARMOND, J. E., BRANDENBURG, N. R., AND BOOSTER, D. E.
Seed cleaning by electrostatic separation.
Agric. Engng, St. Joseph, Mich., 1961, **42**: 22-5, bibl. 12, illus.

The principles of, and current research on, this method are explained. Briefly, seed on a belt is charged by passing it through an electric field and is then conveyed into the field of a negative electrode. Sorting depends on the seeds' adherence to the belt, and this is determined by its specific ability to retain its charge.

Propagation.

(*See also* 3642, 3799-3801, 4355, 4356, 4460, 4956, 4959, 5102, 5103.)

3632. AMAR, S. S.
Esperimenti di colture vegetali su un nuovo substrato. **(Experimental growing of crop plants in a new substrate.)**
Progr. agric., Bologna, 1961, **7**: 483-90, illus.

A spongy cellulose product known as Cellager, obtainable in sheets and small blocks, can be used for growing turf and raising seedlings. When placed on the soil it checks weed growth. For precision sowing over large areas, small blocks of Cellager each containing a seed are fixed over a row of holes in a strip of plastic sheeting, and the required number of strips laid parallel on the soil surface, the soil between being covered with a bituminous film. Blocks for transplanting can be coated on the sides with paint, or kept in a partitioned container similar to those used for making ice cubes in refrigerators, in order to prevent the roots from passing into adjacent blocks. The blocks are a great advantage in mechanical transplanting, as they reduce seedling injury to a minimum.

3633. (SHARPE, F.)
Waste fuel ash is a cheap and efficient rooting medium.
Comm. Gr, 1961, No. 3406, p. 901.

Sieved ash (passing through ⅜-in. mesh) after weathering or flooding was a satisfactory rooting medium for cuttings of many shrubby and herbaceous horticultural species.

3634. ROWE-DUTTON, P., AND GARNER, R. J.
Mist propagation: some problems and possibilities.
Park Administ., 1961, **26**(2): 37-43, illus.

Suggesting lines along which further investigation might prove profitable.

3635. TURECKAJA, R. H.
The role of leaves and buds in the formation of roots on stem cuttings. [Russian, with English summary 10 lines.]
Fiziol. Rast., 1960, **7**: 531-6, bibl. 15, illus.

Soft-wood cuttings of black currant with 2–3 leaves rooted more readily than those without leaves, but the removal of buds did not affect rooting. Soft-wood cuttings of sour cherry with leaves but without buds rooted with difficulty even when treated with IBA. Euonymus cuttings also rooted poorly without buds, but treatment with the sodium salt of heteroauxin promoted root formation in cuttings both with and without buds, suggesting that the compound replaces a natural growth substance present in the buds. The callus of black currant cuttings had a high sugar and starch content, indicating the translocation of nutrients to the site of root formation.

3636. BRIAN, P. W., HEMMING, H. G., AND LOWE, D.
Inhibition of rooting of cuttings by gibberellic acid.
Ann. Bot., Lond., 1960, **24**: 407-19, bibl. 22.

Gibberellic acid inhibited rooting but increased extension of pea and bean stem cuttings; IAA usually had a contrary effect. It was found possible to separate the effects of GA on extension and rooting. Small doses of GA applied to the bases of cuttings reduced rooting without increasing extension; small apical doses increased extension without reducing rooting. Disbudding cuttings prevented extension, but GA inhibited rooting of disbudded cuttings as strongly as that of normal cuttings. The antagonism between GA and IAA was non-competitive. Gibberellin A_1, known to occur naturally in *Phaseolus*, was as active a rooting inhibitor as GA. It is now believed that inhibition of rooting of cuttings by gibberellins is a direct local effect, preventing those early cell divisions involved in transformation of mature stem tissues to a meristematic condition. [From authors' abstract.]—I.C.I. Ltd., Akers Res. Lab., Welwyn.

Soils, soil management and composts.

(*See also* 3633, 3782, 4668, 4990, 5565.)

3637. WHITE, G. C.
A survey of the pH of the soils of East Malling Research Station.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 77-80, bibl. 7, maps.

The whole property was covered by determinations made at 22-yard intervals on both the surface soil (0–6 in.) and sub-soil (6–12 in.). The results are shown very clearly on 2 coloured maps. Most values lay in the range pH 5·5 to 7·5, but the extreme range was as wide as pH 4·0 to 8·5.

3638. GEARD, I. D., AND ALLEN, A. G.
Soil sterilization.
Tasm. J. Agric., 1960, **31**: 407-21, illus.

Sterilization by heat (dry heat, steam and electrical) and by chemicals (formalin, chloropicrin, Vapam, DD, EDB, Nemagon and Cheshunt compound) is discussed with details of equipment and methods.

3639. Langedijk, G. (Transl. by Visser, J.)
Mechanized soil steaming.
Translation from *Groent. en Fruit*, 1957, **13**: 253-4, illus.
A description of the method using a buried grid pulled through the soil by means of a winch.

3640. Johnson, D., and Aas, K.
Investigations of the technique of soil steaming.
Acta Agric. Scand., Suppl. 9, 1960, pp. 69, bibl. 76, illus.
The problems of heat transfer in soils have been studied, and experiments conducted to determine the efficiency of steaming and of the equipment used in practice. The main results are summarized as follows: Steam passes through the soil forming a front in which condensation occurs. The rate of steam injection must be limited in order to prevent canal formation and blow-through losses; in these experiments such losses occurred with an injection rate of 30 to 50 kg. of steam per sq. m. per hour according to soil type. Soil steaming at reduced temperatures by means of air injection into the steam has not been found practicable. Slightly super-heated low-pressure steam has been found most convenient for soil steaming. Calorimetric determinations of the specific heat of different soils were made; differences are very small when specific heat is calculated as kcal/kg ° C. The heat balance for the steaming process was determined, and the different losses specified. The force required to pull out Hoddesdon pipes was also determined; a new graded type of pipe showed a considerable reduction in the force required.—Tech. Univ., Norway, and Norwegian Inst. agric. Engng.

3641. Subramaniam, A., and Premsekar, S.
Further studies on guar as green manure cum vegetable crop.
Premsekar, S., and Subramaniam, A.
A comparative study of cowpea (*Vigna sinensis*) and clusterbean (*Cyamopsis psoraloides*) as green manure crops for gardenlands.
Madras agric. J., 1960, **47**: 478-80, bibl. 1, and 513-16, bibl. 4.
Guar (*Cyamopsis tetragonaloba*) was most suitable as a short duration green manure crop on lighter soils. The optimum seed rate was 40–50 lb. per acre, and the best variety for this purpose was C.P.380. Cowpea was more suitable as a green manure crop than clusterbean because of the higher yield of green matter, the better smothering effect and the higher total N added to the soil. The maximum yield of green matter was obtained with a sowing rate of 70 lb. seed per acre for cowpea and 50 lb. for clusterbean.—Res. Inst., Coimbatore.

3642. Alexander, T. M. W., and Young, N. McP.
Loam free composts.
Park Administ., 1961, **26**(2): 44-9.
Experience with, and instructions for the use of, the Eclipse "No Soil" compost for propagation and as a growing medium.

Water and irrigation.

(*See also* 3783, 4358, 4673.)

3643. Lefèvre, P.
Procédé d'élimination du calcaire des eaux destinées à l'arrosage des cultures horticoles délicates. (**Procedures for the elimination of lime from water to be used for watering delicate horticultural crops.**)
Rev. hort., Paris, 1961, **133**: 22-4, bibl. 9.
The lime may be removed by 2 methods. The first is by demineralization, in which the water passes over one resin which fixes the cations such as Ca and over another which fixes the anions; this results in very pure water, but the regeneration of the resins is a long and delicate process. The second method consists in the precipitation of the lime as insoluble salts, using ammonium oxalate or oxalic acid. If ammonium phosphate and potassium carbonate are combined with the oxalic ion, the lime is removed and a nutrient solution containing the 3 major elements is left.—Stat. Agron., Amiens.

3644. Chimonides, S.
The use of salty waters for irrigation.
Countryman, Nicosia, 1960, Nov.-Dec., pp. 23-5, illus.
Fruit and vegetable crops are listed according to their relative tolerance to salts in the soil solution. When drainage is adequate and deep percolation of water possible, salt water irrigations should be frequent and the soil should be leached at intervals to wash the salts down from the root zone. Where soil drainage is poor, only crops which are salt tolerant should be grown.

3645. Singh, M., Gandhi, R. T., and Raheja, P. C.
A critical review of the methods used to determine water requirements of crops and suggestions for planning future irrigation experiments in India.
Indian J. Agron., 1960, **4**: 272-85, bibl. 35.
Including pot and tank cultures, field studies and climatology.

3646. Nielsen, B. F., and Christensen, S. A.
Vandfordampning i vaeksthuse til bestemmelse af planternes vandbehov. (**Measurement of evaporation in glasshouses for determining the water requirements of plants.**) [English summary 1 p.]
Horticultura, 1960, **14**: 207-21, bibl. 5, illus.
Measurements in the glasshouse and field showed that the rate of evaporation in the relatively controlled atmosphere of the glasshouse was lower than

in the open. The average daily rates of evaporation were calculated for trickle- and hose-irrigated tomatoes and cucumbers. With uncontrolled drainage the factor for $\frac{\text{estimated water supply}}{\text{evaporation}}$ was 1·6–1·7 for glasshouse cucumbers. Tomatoes grown with controlled drainage showed a factor of 1·2 for $\frac{\text{water consumption}}{\text{evaporation}}$. The results are considered to be a promising basis for developing a method of determining the water requirements of glasshouse crops.—Hydrotekn. Lab., and Produktivitetsudvalg. Gartn. Frugtavl, Copenhagen.

3647. Holmes, R. M., and Robertson, G. W.
A modulated soil moisture budget.
Reprint from *Mon. Weather Rev.*, 1959, **87**(3): 1-5, bibl. 24.

Most meteorological soil moisture budgets do not account for soil moisture stress changes in the drying cycle or for changes in ground cover or expanding root systems. A simple modulated technique is described which considers these factors. Soil moisture stress determined by this technique has a significantly higher correlation with wheat yield than does moisture stress determined by a common method. [Authors' abstract.]—Exp. Fms Serv., Canada Dep. Agric., Ottawa.

3648. Till, M. R.
Water budgeting for horticultural crops.
J. Agric. S. Aust., 1960, **64**: 198-200, illus.

A system for determining the irrigation requirements of plants by using weather data is described. Calculation of the water deficit of the soil and the water deficit tolerance of the crop in question will determine when to irrigate and the quantity of water to apply.

3649. Till, M. R.
Irrigation needs of fruit trees, vines and vegetables.
J. Agric. S. Aust., 1960, **64**: 89, 92.

Brief notes on methods of timing irrigation, viz. by fruit measurement, soil moisture measurement and estimating the plant's water needs.

3650. Heinonen, R.
Wilting percentage by the tomato plant method in relation to soil water tension by the pressure membrane apparatus.
Soil Sci., 1961, **91**: 172-4, bibl. 9.

The result of the tomato plant method seems to correspond very nearly to the first permanent wilting percentage; the principal difference is that the former is a real equilibrium value and the wilting percentage is not. The result of the tomato plant method might be exactly designated as "an equilibrium moisture percentage in the exhausted fraction of the root zone", which implies that the main part of the root zone supplies enough moisture to prevent wilting. [Author's conclusions.]—Univ. Helsinki.

3651. Wells, D. A., and Soffe, R.
A tensiometer for the control of glasshouse irrigation. I. Development of the tensiometer. II. Use of the controlling tensiometer.
J. agric. Engng Res., 1961, **6**: 16-26, bibl. 11, illus.

Part I is a description of a tensiometer which will control a glasshouse watering system to maintain the soil moisture tension between a set value and field capacity. The instrument consists of a vacuum switch connected to a tensiometer and is arranged to control the opening and closing of a solenoid valve supplying an irrigation system. Since it has a porous element of high conductance, it is extremely responsive to changes in tension and over-watering is avoided. In part II an account is given of trials lasting 3 years in which the tensiometer was used to control the automatic watering of cucumber beds; the results show that the control of watering was satisfactory. [From authors' abstract.]—N.I.A.E., Silsoe, Beds.

3652. Bouyoucos, G. J.
Soil moisture measurement improved.
Agric. Engng, St. Joseph, Mich., 1961, **42**: 136-8, bibl. 12, illus.

New, more sensitive plaster of paris blocks are described, which can register soil moisture changes at a tension as low as 75 mm. of mercury. The blocks have increased pore space, electrodes ¼ in. apart and parallel to the long sides, and they are nylon resin treated.—Mich. St. Univ., E. Lansing.

3653. (Holmes, J. W., and Turner, K. G.)
The neutron moisture meter.
Rur. Res. C.S.I.R.O., 1960, No. 33, pp. 28-9, bibl. 2, illus.

An instrument is described which projects high speed neutrons into the soil where they are slowed down by collisions with hydrogen atoms which are mostly in the water fraction. A measure of the number of slow neutrons is therefore a measure of the soil water content. The instrument is not accurate within 12 in. of the soil surface.

Nutrition.

(*See also* 3722, 3927, 4596, 4675, 5083, 5157, 5560, 5565.)

3654. Spencer, D., and Possingham, J. V.
The effect of nutrient deficiencies on the Hill reaction of isolated chloroplasts from tomato.
Aust. J. biol. Sci., 1960, **13**: 441-55, bibl. 33.

Tomato plants were grown deficient in each known essential macro- and micro-nutrient (except chlorine), and the effect of each deficiency on the Hill reaction activity of chloroplasts isolated from these plants was studied. All deficiencies, except that of iron, resulted in chloroplasts with reduced Hill reaction activity per unit chlorophyll. Among the micro-nutrients deficiencies of Mn, Cu, Zn, B or Mo caused impairment of activity, in that decreasing order of severity. Some tentative conclusions are drawn concerning the site of the impaired component of the Hill reaction associated with a number of the deficiencies. [From authors' summary.]—C.S.I.R.O., Canberra.

3655. DYAR, J. J.
A relationship between boron and auxin in C^{14} translocation in bean plants.
Diss. Abstr., 1960, **21**: 737-8, being *L.C. Card No. Mic.* 60-4075 of 50 pp.

Sugar translocation to terminal buds was reduced in B-deficient plants, but was resumed when NAA (5 p.p.m.) was applied to the terminal buds. Plants with adequate B showed no reduction in sugar translocation after NAA application to the buds, but growth was reduced after daily applications for a week. Boron deficiency was accompanied by the production of many short lateral roots, but when NAA was supplied to the culture solution sugar translocation to the roots was increased and the lateral roots elongated. The application of NAA to B-sufficient plants was also followed by the production of short lateral roots, but these did not elongate during NAA treatment.—Ohio St. Univ.

3656. HUMPHRIES, E. C.
Effects of quality of light on development of roots on dwarf bean hypocotyls in presence and absence of boron.
Nature, 1961, **190**: 701-3, bibl. 13.

Severed bean hypocotyls were cultured in solutions, with and without added boron, and kept in 2 day-lengths with various combinations of incandescent and fluorescent light. Numbers and weights of roots formed were determined after 14 days. There was no effect of quality of light in an 8-hour photoperiod, but there was an effect in a 16-hour photoperiod. Light treatments did not affect high-boron plants, but shorter day-length decreased the number of roots formed by low-boron plants. Boron deficiency also restricted root growth only with incandescent light; boron had little such effect on plants growing under fluorescent light only. The implications of these and other findings are discussed.—Rothamsted exp. Stat.

3657. GULJAKIN, I. V., AND JUDINCEVA, E. V.
The uptake of cobalt by plants and its accumulation in the crop. [Russian, with English summary ½ p.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 5, pp. 114-22, bibl. 7.

For a shorter account see *H.A.*, 29: 2036.

3658. BROWN, J. C., AND OTHERS.
Iron absorption by roots as affected by plant species and concentration of chelating agent.
Agron. J., 1961, **53**: 81-5, bibl. 12, illus.

Increasing the concentration of chelating agent in a nutrient medium decreased the capacity of roots to absorb Fe. Of 11 plant species tested, growth was impeded sharply in 6 species, including okra and kidney bean, when the molar concentration of chelating agent exceeded that of Fe. Plant species differed also in their capacity to absorb Fe relative to Cu and Mn. [From authors' synopsis.]—U.S.D.A., Beltsville, Md.

3659. VLASJUK, P. A., KLIMOVICKAJA, Z. M., AND VIZIR, K. L.
The role of the root system in the translocation and transformation of manganese in plants. [Russian, with English summary ⅓ p.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 6, pp. 865-73, bibl. 11.

The main work was on field crops, but it is mentioned that in apples and currants more Mn is translocated through the phloem than through the xylem.

3660. STROGONOV, B. P., AND OKNINA, E. Z.
The dormant state of plants under saline conditions. [Russian, with English summary 6 lines.]
Fiziol. Rast., 1961, **8**: 79-85, bibl. 22, illus.

Plants, including tomatoes, grown in soil to which Cl or SO_4 were added ceased to grow and became dormant. The plasmodesma started dividing and the protoplasm became separated in the cells. Removal of the inhibiting ions resulted in the breaking of dormancy and renewal of growth.

Radioactive contamination.

3661. FAO.
Radioactive materials in food and agriculture.
FAO atomic Energy Ser. **2**, Rome, 1960, pp. 123, bibls.

Sources of radioactive contamination and radioactive substances in the food chains culminating in man are discussed, with particular regard to radioactive strontium, caesium and iodine.

3662. NISHITA, H., ROMNEY, E. M., AND LARSON, K. H.
Uptake of radioactive fission products by crop plants.
J. agric. Food Chem., 1961, **9**: 101-6, bibl. 32.

Root absorption from contaminated soils and the distribution of isotopes within the plants were studied in several plants, including lettuces, peas, beans, radishes and carrots. The uptake of Sr^{89-90} was much greater than that of other radioisotopes, which in decreasing order of uptake were I^{131}, Ba^{140}, Cs^{137}, Ru^{106}, Ce^{144}, Y^{91}, Pm^{147}, and Zr^{95}-Nb^{95}. Leaves showed the highest content of fission products, comparatively low levels being found in seeds, fruits or edible roots. The amount of fission products taken up by the plant can be altered by various soil management practices, such as cultivation, fertilization or organic matter application.—Univ. Calif., Los Angeles.

3663. Tukey, H. B., Wittwer, S. H., and Bukovac, M. J.
Absorption of radionuclides by aboveground plant parts and movement within the plant.
J. agric. Food Chem., 1961, **9**: 106-13, bibl. 52, illus.

The above-ground parts of plants, including beans, readily absorbed radionuclides from external spray application. Entry occurred through the leaves, stem, fruit and bark. The rate of absorption, the extent of subsequent transport and the pattern of distribution within the plant were dependent upon the nature of the radionuclide and also upon many internal and external factors, such as the pH of the spray application and the age of the leaf, etc. Both acropetal and basipetal transport occurred following the application of P^{32}, K^{42}, Rb^{86}, and Cs^{137} to aerial parts, but with Ca^{45}, Sr^{89}, Sr^{90}-Y^{90}, Ru^{103} and Ba^{140} the radionuclides did not move freely from the absorbing aerial organ and basipetal transport was negligible. [From authors' abstract.]—Mich. St. Univ., E. Lansing.

3664. Christenson, C. W., and Fowler, E. B.
Depth of feeding as it affects the concentration of radioactivity within the plant.
J. agric. Food Chem., 1961, **9**: 98-100, bibl. 5.

A study is described of the uptake of radioactive fall-out by plants, including lettuces. It was found that after 46 days' growth lettuce roots were feeding more than 20 in. beneath the soil surface. Since the fall-out is concentrated near the soil surface, only a small proportion will be transported to the roots, and the major portion of the fall-out material in plants must therefore be due to foliar absorption.—Univ. Calif., Los Alamos, N.M.

3665. Guljakin, I. V., and Judinceva, E. V.
Uptake by plants and accumulation in the crop of some radioactive fission products. [Russian, with English summary ½ p.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 6, pp. 874-85, bibl. 14.

The uptake and accumulation of Sr^{90} and Cs^{137} in plants, including peas, are discussed. Uptake was more intensive from light than from heavy soils. Liming of acid soils and the application of organic manures reduced uptake, especially on light soils. [For earlier work see *H.A.*, 30: 3126.]

3666. Guljakin, I. V., Judinceva, E. V., and Levina, E. M.
The response of caesium-137 to potassium in the soil and in plants. [Russian, with English summary 8 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 3, pp. 18-29, bibl. 6, illus.

In experiments with the pea variety Torsdag and the beetroot variety Bordeaux it was found that the ratio of Cs^{137} to K in the pods depends to a greater extent on the rate of uptake of Cs^{137} from the soil than on that of K. A certain relationship, which varied with the plant species, was observed between the rates of absorption of Cs^{137} and K. [For earlier work, see *H.A.*, 29: 3203m and 30: 3126.]

Soilless culture.

(*See also* 3794, 4357, 4981.)

3667. Favilli, R., and Massantini, F.
La sperimentazione sulle colture idroponiche. **(Experiments on hydroponic culture.)**
Progr. agric., Bologna, 1960, **6**: 1034-45, bibl. 2, illus.

The experimental hydroponics greenhouse at the Institute of Agronomy, Pisa, contains 12 reinforced concrete tanks 90 × 90 × 40 cm., each with a separate 200-l. reservoir. Tomatoes are grown on gravel with sub-irrigation. Notes are given on the pumping system and on the heating of the greenhouse. [See also *H.A.*, 31: 1728.]

3668. Brouwer, R.
De invloed van de aëratie van het wortelmilieu op de groei van bruine bonen. (**The effect of aeration of the rooting medium on the growth of brown beans.**) [English summary 11 lines.]
Jaarb. Inst. biol. scheik. Onderz. LandbGewas. Wageningen, 1960, pp. 11-21, bibl. 11, illus.

Dry matter production of beans growing in an aerated water culture was higher than that of beans in a non-aerated medium. Yield differences became greater as light intensities increased, and as the atmospheric humidity decreased. The lower dry matter production of plants in non-aerated media resulted from reduced leaf growth.

Tissue culture.

(*See also* 3678, 4817, 5392.)

3669. Butenko, R. G.
A method of culturing isolated terminal buds for the study of growth and organogenesis in plants. [Russian, with English summary 8 lines.]
Fiziol. Rast., 1960, **7**: 715-23, bibl. 17, illus.

Apical buds of *Perilla nankinensis*, *Rudbeckia bicolor*, *Nicotiana tabacum*, *N. sylvestris* and some other plants were successfully grown under sterile conditions in nutrient solution. They developed stems, leaves, roots and flowers and produced normal seeds. Growth and development were affected by day length and by physiologically active substances added to the solution, some of which, such as purines and pyrimidines, induced flowering in perilla under long-day conditions [see also *H.A.*, 30: 3137], whereas GA induced flowering in rudbeckia under short-day conditions.

Physiology and metabolism.

(*See also* 3656, 3669, 3711, 3811-3813, 4054, 4135, 4499, 4501, 4659, 4975, 5014, 5018, 5029, 5030, 5166-5168, 5253, 5334, 5585.)

3670. Brouwer, R., and van Vliet, G.
De invloed van de worteltemperatuur op groei en opname bij erwten. (**The effect of root temperature on the growth and assimilation of peas.**) [English summary ¼ p.]
Jaarb. Inst. biol. scheik. Onderz. LandbGewas. Wageningen, 1960, pp. 23-36, bibl. 8, illus.

Peas grown at various root temperatures showed the greatest increase in fresh and dry weights of stems, leaves and roots at 22° C. This temperature was also optimal for uptake of water, K and nitrate. Potassium uptake in relation to fresh weight increase was lower at higher temperatures. The transpiration coefficient increased with the root temperature.

3671. Šahov, A. A., and Golubkova, B. M.
Electron microscopical study of plant chloroplasts when the root system is at a low temperature. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **135**: 486-8, bibl. 14, illus.

Chloroplasts in the leaves of tomato plants with their roots cooled to 8–8·5° C. lost their regular shape and the chloroplast granules became less pronounced.

3672. Rubin, B. A., and Germanova-Gavrilenko, V. F.
Fe-porphyrine contents of roots in relation to their greening capacity. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **135**: 478-81, bibl. 17.

Roots of lupin, broad bean, pea and sunflower all developed more than 2 mg. of chlorophylls a + b per 100 g. fresh weight when exposed to illumination, whereas nasturtium roots developed very much less and onion roots none at all. Pea and broad bean roots infected with root-nodule-forming bacteria developed more chlorophyll than non-infected roots. The contents of catalase, cytochrome oxidase and chlorophyll in leaves of nasturtium grafted on broad bean roots were higher than in ungrafted plants, and higher still if the bean roots were infected with bacteria.

3673. Jensen, G.
Effects of temperature and shifts in temperature on the respiration of intact root systems.
Physiol. Plant., 1960, **13**: 822-30, bibl. 28.

In tomato plants the Q_{10} for root respiration decreased with increasing temperatures, whereas the gas exchange quotient value increased with temperature. Various explanations for these phenomena are suggested.—Roy. vet. agric. Coll., Copenhagen.

3674. Petinov, N. S., and Molotkovskij, Ju. G.
The effect of respiration inhibitors on the heat resistance of plants. [Russian, with English summary ½ p.]
Fiziol. Rast., 1960, **7**: 665-72, bibl. 15, illus.

Inhibition of respiration in detached tobacco and squash leaves treated with KCN, monofluoroacetate, arsenite or 2,4-dinitrophenol was accompanied by intensified proteolysis, cessation of amino acid synthesis and accumulation of ammonia and γ-aminobutyric acid in the tissues. The subsequent pronounced reduction in resistance to high temperatures was attributed to the loss of ability to re-synthesize the proteins destroyed by heat, for which the active metabolites and energy are provided by respiration. The similar effects of heat and 2,4-dinitrophenol on the phosphorus metabolism indicated that oxidative phosphorylation might be an important factor in the heat resistance of plants.

3675. Voskresenskaja, N. P., and Grišina, G. S.
Oxygen uptake by green leaves as affected by the intensity and spectral composition of light. [Russian, with English summary 9 lines.]
Fiziol. Rast., 1960, **7**: 497-506, bibl. 39.

The uptake of O_2 by bean and tobacco leaves in the absence of CO_2 was enchanced by increasing the intensity of illumination in the 580–700 mμ and 400–580 mμ regions, the effect in the latter region being the greater. The oxidase involved differed from that which takes part in the respiratory cycle in respect of its reaction with sodium azide, indicating a difference between the mechanism of O_2 absorption in light and in darkness.

3676. Nuernbergk, E. L.
Endogener Rhythmus und CO_2-Stoffwechsel bei Pflanzen mit diurnalem Säurerhythmus. (**Endogenous rhythm and CO_2 metabolism in plants with a diurnal cycle of acidity.**)
Planta, 1961, **56**: 28-70, bibl. 42, illus.

Crassulacean acid metabolism (CAM) is reviewed and experiments on *Bryophyllum daigremontianum* are described. CAM was found to possess an endogenous 24-hour rhythm, which persisted under various combinations of a 36-hour light/darkness photoperiod, involving the high energy reaction of the red, infra-red pigment system. It persisted under constant illumination with a sodium vapour lamp but ceased under stronger fluorescent light. Changes in pH of the cell sap paralleled CAM over the 24-hour period. Sucrose enrichment of the leaves led to greater evolution of CO_2. The evolution and uptake of CO_2, the effects of CO_2-free air and the chemistry of CAM were also investigated.—Staatsinst. allgem. Bot., Hamburg.

3677. Saenko, G. N.
The primary products of photosynthesis and methods of isolating them. [Russian.]
Fiziol. Rast., 1960, **7**: 605-7, bibl. 12, illus.

Radiochromatographic analysis of extracts from leaves of *Primula obconica* indicated that an hydroxy acid is probably the primary product of photosynthesis.

3678. Butenko, R. G., Ničiporovič, A. A., and Protasova, N. N.
The biological importance of the diversity of photosynthetic products. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **135**: 210-12, bibl. 9, illus.

Leaf extracts were prepared from beans grown under (a) either red, blue or white light for 14 days, (b) white light for 14 days, followed by 24 hours in darkness and then 3 hours in either red or blue light or darkness, with or without CO_2. The effects of these extracts on the proliferation of carrot tissue cultures are discussed and illustrated.

3679. Meijer, G., and van der Veen, R.
Dual effect of nightbreak light.
Acta bot. neerl., 1960, **9**: 220-3, bibl. 3.

Salvia occidentalis growing in short-day induction photoperiods of 8 hours of blue light plus 4 hours of red light showed no long-day effect following 15 minutes' exposure in the night to red light. This same period of nightbreak light resulted in a short-day effect when given after a main light period of 10 hours of blue light plus 4 hours of red light, which by itself induced a long-day effect. [See also *H.A.*, 31: 71.]—Philips Res. Labs, Eindhoven.

3680. Wellensiek, S. J.
Does darkness inhibit floral initiation in long day plants?
Proc. kon. ned. Akad. Wetensch. Ser. C, 1960, **63**: 155-8, bibl. 2.

In the long-day plants *Arabidopsis thaliana* Köln, *Hyoscyamus niger* and *Silene armeria* temporary darkness during the inductive treatment does not exert an inhibitive action on the induction of flower buds. In *A. thaliana* the process comes to a stand-still or is slowed down appreciably as long as the plant is in darkness, but even this is not the case with the other 2 species. This difference might be connected with the fact that *A. thaliana* is only a quantitative short-day plant. [From author's summary.]—Lab. Tuinbouwpl., Wageningen.

3681. Wellensiek, S. J.
Stem elongation and flower initiation.
Proc. kon. ned. Akad. Wetensch., Ser. C, 1960, **63**: 159-66, bibl. 14, illus.

Stem elongation was obtained in several plants by gibberellic acid under conditions non-inductive for flower initiation. The flower initiation of such plants was compared under inductive conditions with that of the controls. In the cold-requiring *Lunaria biennis* stem elongation is an introductory step to flower initiation; in *Campanula medium* there is no relationship between the two processes. In the short-day plant Maryland Mammoth tobacco stem elongation retards flower initiation [see *H.A.*, 31: 2704]. In the quantitative long-day plant *Arabidopsis thaliana* stem elongation is promoted by GA after flower initiation. In the qualitative long-day plant *Hyoscyamus niger* stem elongation is an introductory step to flower initiation; in *Silene armeria* and *Trifolium pratense* the two processes are independent. [From author's summary.]—Lab. Tuinbouwpl., Wageningen.

3682. Čajlahjan, M. H.
Photoperiodic sensitivity of plants deprived of stems or roots. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **135**: 213-16, bibl. 10, illus.

Experiments are described which show that *Rudbeckia bicolor*, deprived of either stems and buds or of roots, will flower when given 20 long days, i.e. will respond to photoperiodic treatment by producing the metabolites necessary for flowering. [For similar work with perilla see *H.A.*, 28: 2080.]

3683. Čajlahjan, M. H., and Hlopenkova, L. P.
The factors controlling stem growth in rosette plants of long-day species. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **135**: 482-5, bibl. 17, illus.

Plants of rudbeckia, either with or without roots, were grown in vessels of water or nutrient solution, in long or short days and with or without gibberellin treatment. In long days all the plants showed a tendency to form flowering stems: in short days flowering stems formed only after gibberellin treatment. In both of these conditions stem formation was retarded by the absence of roots or of the nutrient medium and severely retarded by the absence of both.

3684. Čajlahjan, M. H., Butenko, R. G., and Ljubarskaja, I. I.
The effect of the derivatives of nucleic acid metabolism on the growth and flowering of red perilla. [Russian, with English summary 9 lines.]
Fiziol. Rast., 1961, **8**: 101-13, bibl. 52, illus.

The introduction of purines, pyrimidine and RNA nucleosides into a growth medium, in which isolated terminal buds of *Perilla nankinensis* were cultured, resulted in acceleration of flowering under short-day conditions and induction of flowering under long-day conditions. Of the substances used a mixture of RNA nucleosides and casein hydrolysate exerted the greatest stimulus on flowering. The addition of ribonuclease to the medium, however, reduced generative, and increased vegetative, growth.

3685. Vergara, B. S., and McIlrath, W. J.
Influence of photoperiod on water uptake of *Xanthium*.
Bot. Gaz., 1960, **122**: 96-102, bibl. 19.

Plants of *Xanthium pensylvanicum* which were grown in culture solution under glasshouse conditions and exposed to continuous photoinduction exhibited peaks in water absorption coincident with the appearance of macroscopic flowers and with anthesis. Plants given continuous photoinduction in a controlled-environment room at 70° F. had a single period of accelerated water uptake coincident with meiosis; anthesis occurred after the rate of absorption had declined. Leaf sprays of 0·01–1,000 p.p.m. IAA applied to non-induced plants did not promote water uptake. Applications of 10 and 100 p.p.m. 2,4-dichloroanisol resulted in a slight stimulation of absorption. Absorption by disbudded plants under photoinductive day lengths was similar to that of intact photoinduced plants. It is concluded that the onset of reproductive phases normally correlated with accelerated water uptake is merely a parallel occurrence and not a causative factor in water uptake. [From authors' summary.]—Univ. Chicago.

3686. Thomas, R. G.
Promotion of leaf growth by short days in the short-day plant *Chenopodium amaranticolor*.
Nature, 1961, **189**: 771-2, bibl. 3.

Experiments are described which indicated that conditions which led to flowering also promoted vegetative growth. The growth stimulus, however, appeared to be related to some step preceding the initiation of flower primordia and did not emanate from them.—D.S.I.R., Palmerston North, N.Z.

3687. Thomas, R. G.
The relationship between leaf growth and induction of flowering in long-day plants (LDP).
Naturwissenschaften, 1961, **48**: 108, bibl. 4.

Seedlings of spinach were germinated under short-day (SD) conditions. Two weeks later they were divided into 4 groups of 8 plants which received 0, 2, 4 or 6 days of continuous light (CL) and were then returned to SD. Measurements made 2 weeks after the start of CL showed a pronounced stimulation of leaf growth by such treatment. Six days of CL induced flower formation and stem elongation. Apices of plants given 2 or 4 days of CL were elongated in comparison with the controls, but no flower primordia were formed. Day lengths which led to the initiation of double ridges in *Chenopodium amaranticolor* stimulated leaf growth in LDPs as well as SDPs.—D.S.I.R., Palmerston North, N.Z.

3688. Sági, F., and Garay, A. S.
Abhängigkeit der Auxinoxydase-Aktivität von dem photoperiodisch bedingten Phenolgehalt und dem Lebensalter in *Lupinus albus* L. (**The dependence of auxinoxidase activity on the photoperiodically conditioned phenol content of the leaves and on their age in *Lupinus albus*.**)
Naturwissenschaften, 1961, **48**: 107-8, bibl. 10.

Analyses were made of the phenol content and IAA-oxidase activity in young leaves of different ages exposed to either long- or short-day photoperiods, to determine whether the observed falling off of IAA-oxidase activity with age is connected with a greater quantity of inhibitors (polyphenols) or with the disappearance of the enzyme from the leaves. It was found that phenol content increased continuously with age, whereas the IAA-oxidase activity rose to a peak and thereafter declined.—Inst. PflZücht., Fertöd, Hungary.

3689. Burley, J. W. A.
A comparative study of carbohydrate translocation in apple, raspberry and soybean.
Diss. Abstr., 1960, **21**: 737, being *L.C. Card No. Mic.* 60-4066 of 43 pp.

Using labelled carbon.

3690. Prát, S.
Distribution of the humus substance fractions in plants. [Czech and Russian summaries 5 and 6 lines.]
Biol. Plant., Prague, 1960, **2**: 308-12, bibl. 6.

By applying labelled humic and fulvic acids to leaf surfaces in solution or in pastes it was shown that neither of these compounds was absorbed by leaves of *Aesculus*, *Pelargonium* and *Phaseolus*, but that the latter was absorbed to some extent by the leaves of tomato.—Charles Univ., Prague.

3691. Booth, V. H., and Hobson-Frohock, A.
The α-tocopherol content of leaves as affected by growth rate.
J. Sci. Food Agric., 1961, **12**: 251-6, bibl. 12.

Fast-growing leaves of cress and lettuce had tocopherol [vitamin E] contents of about 70 p.p.m. based on dry matter, whereas evergreen and other slow-growing leaves had up to 1,400 p.p.m. In long leaves of iris and narcissus the α-tocopherol content was low near the base where growth is fast and maximal near the apex where growth is slow. In young short leaves of narcissus the gradient was only slight. Tocopherol contents of leaves increased during the summer and reached maxima in the autumn or winter. In evergreen leaves the values fell in spring. Dying and fallen leaves had higher contents than green leaves. In blooms of narcissus the α-tocopherol contents diminished considerably during development. It is concluded that the α-tocopherol content of leaves is inversely related to the growth rate. [From authors' summary.]—Dunn nutrit. Lab., Cambridge.

3692. Bollard, E. G.
Urease, urea and ureides in plants.
Reprint from *Symp. Soc. exp. Biol. No. XIII, Utilization of nitrogen and its compounds by plants*, 1959, pp. 304-29, bibl. 136.

The occurrence of urea, and of substances yielding urea, and their metabolism by the plant are reviewed.

3693. Budnickaja, E. V., and Borisova, I. G.
Oxidative transformations of lipids in the leaves of irradiated plants. [Russian, with English summary ¼ p.]
Biohimija, 1961, **26**: 142-7, bibl. 17, illus.

The disappearance of oleic and other unsaturated acids from the free lipid fraction of bean and pea seedlings subjected to ionizing radiation (at 1,000r), together with a rise in the lipid peroxide content, indicated an increase in the lipoxidase activity. No such effect was obtained by irradiation of lipid substrates or leaves, in which the lipoxidase had been inactivated by steam.—Inst. Biochem., Moscow.

3694. Bowen, H. J. M., and Cawse, P. A.
Some effects of gamma radiation on plant transpiration.
Radiat. Res., 1960, **13**: 395-402, from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 15077.

Doses of from 12·5 to 100 krad. had a marked transient effect on the transpiration rates of intact tomato plants. When tomato shoots were irradiated alone, with the roots shielded, the transpiration rate was decreased; but when the roots were irradiated with the shoots shielded the rate was slightly increased. At doses of 50 krad. and above whole plants gave a transpiration curve which showed both of these effects, as the rate first decreased, then increased again, and finally settled down at a value lower than the initial one.—Wantage Radiat. Lab., Grove, Berks.

3695. Neary, G. J., Tonkinson, S. M., and Williamson, F. S.
The relative biological efficiency of single doses of fast neutrons and gamma-rays on *Vicia faba* roots and the effect of oxygen. I. Reduction of root growth. [French and German summaries.]
Int. J. Radiat. Biol., 1959, **1**: 210-15, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 45626.

Primary roots of *Vicia faba* were irradiated with fast neutrons or with cobalt-60 gamma-rays. The reduction in root growth was taken as the measure of the biological effect of the radiation. The dose-response curves for neutrons and gamma-rays were of different shapes. The relative biological efficiency was about 15 for small doses, falling to a minimum of 7 as the dose increased, and the form of the variation was consistent with what would be expected if reduction of root growth was principally due to chromosome damage. The presence of O_2 increased the radiosensitivity to fast neutrons.—Med. Res. Coun., Radiobiol. Res. Unit, Harwell, Berks.

3696. Limar', R. S.
The influence of ultrasonic vibrations on plant growth. [Russian.]
Vestn. sel'sk. Nauki, 1960, **5**(9): 72-6, bibl. 21.

The literature is reviewed, and the results of experiments, including some with seedlings of *Phaseolus aureus*, are recorded. Treatment with 1,000 or 500 kilohertz was continued for various periods of time ranging from 10 to 240 sec. and at various voltages. Certain combinations of these variables, notably 500 kilohertz at 4 kv. for 60, 120 or 240 sec., resulted in stimulation of the growth of the seedling roots compared with those of untreated controls. Other combinations had no effect.

3697. Filov, A. I.
Ecological variations in the epidermis of succulent fruits. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **134**: 1481-3, bibl. 11, illus.

In melons and cucumbers indigenous to hot, arid regions the epidermal cells cutinized more intensively than in temperate-zone types. Variation in epidermal activity in relation to ecological conditions had been noted earlier to a similar degree in apples, and to a lesser extent in tomatoes, grapes, plums, apricots, peaches and cherries.

3698. Franke, W.
Untersuchungen zur Frage nach der Funktion der Ektodesmen. (**An investigation into the function of ectodesmata.**)
Naturwissenschaften, 1961, **48**: 227-8, bibl. 2, illus.

Droplets observed in the cuticle of the inner epidermis of bulb scales of *Allium cepa* had a patterned arrangement corresponding to the anticlinal walls of the epidermal cells. Ectodesmata and droplets corresponded on either side of the cuticle, and it is suggested that they play an important rôle in the loss and uptake of substances by leaves.—Inst. landw. Bot., Univ. Bonn.

3699. (ROVIRA, A. D.)
Root exudates.
Rur. Res. C.S.I.R.O., 1960, No. 33, pp. 24-7, bibl. 3, illus.

The nature of plant root exudates and their effects on the microorganisms in their immediate vicinity are discussed.

3700. UZORIN, E. K.
Exchange of substances between neighbouring higher plants and soil algae. [Russian.]
Fiziol. Rast., 1961, **8**: 119-22, bibl. 11.

Six experiments are described, in one of which S^{35} applied to leaves of pea seedlings in water culture was detected in soil algae added to the solution.

Growth substances.

(*See also* 3636, 3681, 3683, 3685, 3768, 3780, 3781, 3986, 4056, 4435, 4459-4462, 4481, 4498, 4518, 4521, 4613, 4622, 4661-4666, 4726, 4758, 4761, 4809, 4838, 4870, 4960, 4974, 4991, 5002, 5019, 5028, 5066, 5101, 5103, 5104, 5119, 5244, 5271, 5336, 5360, 5376, 5411, 5439, 5479, 5543, 5585.)

3701. AUDUS, L. J., AND LAHIRI, A. N.
Studies on the geotropism of roots. III. Effects of geotropic stimulation on growth-substance concentrations in *Vicia faba* root tips.
J. exp. Bot., 1961, **12**: 75-84, bibl. 23.

The auxins contained in the tips of horizontally and vertically grown roots were compared. At about the time curvature began in the horizontal roots there was a marked increase in the content of an auxin corresponding to AP(ii) of pea roots, and there were indications that this was not due to its release from an inactive bound state but that it was either synthesized *de novo* or converted from another auxin. [From authors' summary. For part II see *H.A.*, 27: 3048.]—Bedford Coll., London Univ.

3702. LINCOLN, R. G., MAYFIELD, D. L., AND CUNNINGHAM, A.
Preparation of a floral initiating extract from *Xanthium*.
Science, 1961, **133**: 756, bibl. 4.

An extract from lyophilized tissue of flowering *X. strumarium* plants initiated floral development when applied to *Xanthium* test plants maintained under long-day photoperiodic conditions. Details of the preparation of the extract are described. [Authors' abstract.]—Long Beach St. Coll., Calif.

3703. KENT, M., AND GORTNER, W. A.
Conversion of indoleacetaldehyde to indoleacetic acid by microbial contamination.
Reprint from *Biochem. biophys. Res. Commun.*, 1960, **3**: 319-22, bibl. 3.

In pineapple tissue extracts.

3704. LEBLOVÁ, S., JIRÁČEK, V., AND KOŠTÍŘ, J.
Vliv organických isothiokyanátů na růst a metabolismus rostlin. I. Působení allylisothiokyanátu na klíčení a růst řepky, pšenice a hrachu. (**The influence of organic isothiocyanates on the growth and metabolism of plants. I. The action of allylisothiocyanates on the germination and growth of rape, wheat and peas.**) [Russian and German summaries ½ p. each.]
LEBLOVÁ, S., AND JIRÁČEK, V.
Idem. II. Působení allylisothiokyanátu (AITK) na dusíkatý metabolismus u klíčních rostlin hrachu. (**The effects of allylisothiocyanate on the nitrogen metabolism of pea seedlings.**) [Russian and German summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 651-62, bibl. 51, and 663-78, bibl. 23.

I. The inhibiting influence of allylisothiocyanate on the germination and growth of peas and rape was greatest during the initial phase of germination and least during the later phases. It seemed to have no significant effect on water relations. II. Concentrations of 10^{-4} to 10^{-2} inhibited N metabolism in pea seedlings to some extent, and also altered it, especially with regard to amines, amides, ammonium compounds and free amino-acids. [From authors' summaries.]

3705. CANNY, M. J., AND MARKUS, K.
The breakdown of 2,4-dichlorophenoxyacetic acid in shoots and roots.
Aust. J. biol. Sci., 1960, **13**, 486-500, bibl. 13, illus.

Measurements have been made of the rate of evolution of labelled CO_2 from shoots and from roots of tick beans which had been treated on one leaflet with a small dose of labelled 2,4-D. The CO_2 evolved from the roots was consistently more radioactive than that from the shoot, suggesting that 2,4-D is more rapidly broken down in the former, and the total loss of labelled carbon in 4 days corresponded to about 5% of the applied dose of growth substance. 2,4-D was not readily extractable from the roots at the conclusion of the respiration run, and the labelled carbon was shown to be present there in many compounds that were not 2,4-D. It is concluded that, though part of the side-chain was rapidly lost from the plant as CO_2 from the roots, this is not a main pathway involved in the inactivation of this growth substance. [From authors' summary.]—Cent. Res. Labs., I.C.I.A.N.Z., Ascot Vale, Vict.

3706. SÍVORI, E., AND RUMI, C.
Variación del crecimiento en segmentos de pecíolos de *Tropaeolum majus* provocado por la interaccíon de ácido giberélico y ácido indolacético. (**Variation in the growth of**

petiole segments of *Tropaeolum majus* produced by the interaction of gibberellic and indoleacetic acids.) [English summary ½ p.]
Phyton, 1960, **15**: 119-27, bibl. 51.

A method has been developed of determining auxin activity using petiole segments of *Tropaeolum majus*. There was a seasonal variation in response to IAA which may be attributed to the presence of inhibitors or cofactors. GA alone promoted little growth. A synergistic action of IAA and GA when applied together also showed variations depending on the time of the year. For 5 p.p.m. of IAA the limiting dose of GA was below 0·2 p.p.m. For 1 p.p.m. of GA the curve of synergistic growth given by IAA was similar to that of IAA alone. The variation in synergistic activity at different times of the year was independent of the variation shown by IAA alone. [From authors' abstract.]—Univ. Nac., La Plata, Argentina.

3707. KENTZER, T., AND LIBBERT, E.
Blockade des Gibberellinsäure-Transports in Hypocotylsegmenten durch Trijodbenzoesäure. Zugleich ein neuer Agarblocktest auf Gibberelline. (**The blocking of gibberellin transport in the hypocotyl with triiodobenzoic acid, together with a new agar block test for gibberellin.**) [English summary 8 lines.]
Planta, 1961, **56**: 23-7, bibl. 8.

Transport of GA through hypocotyl sections of sunflower was significantly lower in sections treated with TIBA than in the controls.

3708. HALEVY, A. H., AND CATHEY, H. M.
Effects of structure and concentration of gibberellins on the growth of cucumber seedlings.
Bot. Gaz., 1960, **122**: 63-7, bibl. 17.

The growth of Marketer cucumber seedlings grown in Petri dishes on filter paper moistened with various gibberellin solutions was studied. Gibberellin A_4 was significantly more active than were gibberellins A_1, A_2 or A_3 in promoting hypocotyl elongation of seedlings growing in light. The potassium, sodium and zinc salts of gibberellin A_3 were as active as the free acid. The butyl cellosolve ester of gibberellin A_3 was almost as active as the free acid, but the methyl, butyl and octyl esters were relatively inactive. The hypocotyls of light- and dark-grown seedlings responded to a concentration of potassium gibberellate as low as 3×10^{-6} M. The optimal concentration was 7×10^{-4} M in the dark and 3×10^{-3} M in the light. Increasing the concentration above the optimum decreased the stimulation effects, and the highest concentrations retarded growth. The effects of potassium gibberellate on the radicles varied according to concentration and light conditions. Stimulation was observed in the light at 3×10^{-6} M and in the dark from 3×10^{-6} to 3×10^{-4} M and from 3×10^{-3} to 6×10^{-3} M. Retardation was observed from 3×10^{-5} to 4×10^{-3} M in the light and at 7×10^{-4} M in the dark. The highest concentrations had no effect on root length. [From authors' summary.]—U.S.D.A., Beltsville, Md.

3709. RAZUMOV, V. I.
The importance of gibberellin in the development of plants. [Russian.]
Agrobiologija, 1960, No. 3, pp. 406-19, bibl. 33, illus.

Experiments are described and illustrated on the use of GA in seed vernalization, and on its effects on the development of short-day and long-day plants. Seeds of 4 varieties of carrot treated with 0·1% GA produced plants with smaller roots but much taller tops than untreated seeds. GA-treated carrots developed stems up to 13 cm. high. Sunflowers treated for 30 days with 0·1% GA flowered in 24-hr. days. Hemp plants normally develop compound leaves in short days, but with GA treatment at day lengths above 6 hours most of the leaves were simple. *Perilla* plants flowered after 36 days in 9-hr. days after GA treatment and after shorter time intervals than untreated plants in 12-, 15- and 18-hr. days. Flowering did not occur at all in untreated plants in 9-hr. days.

3710. MUROMCEV, G., AND OTHERS.
The effect of gibberellins on some crop plants. [Russian, with English, German and French summaries 8 lines each.]
Vestn. sel'sk. Nauki, 1960, **5**(11): 46-50, bibl. 4.

Trials with 2 varieties of tomato showed that sprays of GA applied to seedlings and/or inflorescences of mature plants (10–100 mg./l.) accelerated ripening of the fruit and increased yields by 23–66%. Seedlings of carrot, turnip and radish sprayed with GA all produced flower stalks and flowers in their first year, although no seeds were set. This stimulation of development above ground resulted in decreased root weight.

3711. SALE, P. J. M., AND VINCE, D.
Effects of light and gibberellic acid on internode growth in *Pisum sativum*.
Physiol. Plant., 1960, **13**: 664-73, bibl. 11.

The inhibition of internode elongation by light was partly, but not completely, prevented by the application of large [80 mg./l. ethanol] doses of gibberellic acid. Although elongation following the application of GA was greater in the light than in the dark, internode lengths of plants in the light treatments plus GA were in all cases less than those of plants grown in the dark plus GA. Dwarf and tall varieties responded differently to wavelength of light. In dwarf varieties the shortest internodes occurred always in red light. In tall varieties the relative effectiveness of red and blue light varied with the duration of irradiation; when daily irradiation periods of ¼-hour were given the shortest internodes occurred in red, but when longer periods were given blue light became increasingly more effective than red in inhibiting internode elongation. When GA was applied, the different responses of tall and dwarf varieties to red and blue light were almost completely eliminated. Infra-red largely reversed the effect of a previous red light treatment, but had considerably less effect following a blue treatment. There was no interaction between GA and infra-red; both caused internode elongation, and they were almost completely additive in their effects. [From authors' summary.]—Univ. Reading, Shinfield.

3712. Čajlahjan, M. H., and Ložnikova, V. N.
Gibberellin-like substances in higher plants and their effect on growth and flowering. [Russian, with English summary ½ p.]
Fiziol. Rast., 1960, **7**: 521-30, bibl. 33, illus.

Gibberellin-like substances were found in the leaves of both long-day plants, such as *Rudbeckia bicolor* and *Nicotiana sylvestris*, and short-day plants, such as *Perilla nankinensis* and *N. tabacum* var. Mammoth. The total amount of these substances was greater in both groups of plants under long-day than under short-day conditions. Transition from the vegetative to the generative phase did not affect the content of these compounds, which had the same effect on stem growth and flowering in rudbeckia as pure gibberellin. The fact that flowering was induced in rudbeckia grown under short days by leaf extracts from *N. tabacum* grown under long days is held to confirm the suggestion that flowering is induced by 2 groups of substances: gibberellins (in the tobacco extract) and anthesins (in the rudbeckia tissues). [See also *H.A.*, 30: 1560.]

3713. Tamchyma, J., and Šebánek, J.
O stimulačních účincích glukothiokarbamidu na klíčeni a růst rostlin. (**The stimulating action of glucothiocarbamide on the germination and growth of plants.**) [Russian and German summaries ⅓ p. each.]
Rostlinná Výroba, 1960, **6**: 1223-34, bibl. 6, illus.

Germination and growth of peas were stimulated by soaking the seeds for 16 hours in a 1·0% solution of glucothiocarbamide. The effects of glucothiocarbamide were compared with those of GA, and it was found that, in contrast to GA, the carbamide stimulated growth of all parts of the plant, was associated with an increase in the dry weight of the epicotyl, and increased the water-holding capacity of the plant.

3714. Humphries, E. C.
Inhibition of root development on petioles and hypocotyls of dwarf bean (*Phaseolus vulgaris*) by kinetin.
Physiol. Plant., 1960, **13**: 659-63, bibl. 24, illus.

Kinetin, applied at 0·1, 1·0 and 10·0 mg./l., inhibited root formation and, on petioles but not hypocotyls, induced callus formation [see also *H.A.*, 31: 1773]. When it was later withheld, normal roots originated from the callus. Kinetin also counteracted the induction of roots by NAA. —Rothamsted exp. Stat., Harpenden.

3715. Engelbrecht, L., and Mothes, K.
Kinetin as a heat-resistance factor. [German ?]
Ber. dtsch. bot. Ges., 1960, **73**: 246-57, bibl. 21, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-164.

Immersion of tobacco leaves in water at 50° C. for 60 sec. caused no visible damage, but induced premature withering owing to the loss of amino acids to neighbouring sound tissue. Kinetin applied as a spray before or after heating fully counteracted the damage by stimulating the accumulation of amino acids; if applied before heating it also increased the heat resistance of the tissue.

3716. Kozlova, N. A., Ermolaeva, E. Ja., and Backa, P.
The influence of maleic hydrazide on the flowering of *Perilla ocymoides* L. in long-day conditions. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **130**: 231-3, bibl. 6, illus.

Plants grown in long-day conditions (more than 16 hr.) were induced to form flower primordia within 15–20 days by treatment with a 0·25% solution of maleic hydrazide. Apices of treated and untreated plants are illustrated with photomicrographs.

3717. Shimada, T.
Effects of low concentrations of MH on the reproductive phase in a short-day plant, *Xanthium japonicum*. 2. [Japanese, with English summary 1 p.]
Agric. Bull. Saga Univ., 1959, No. 8, pp. 35-72, bibl. 56 [in English], illus.

Plants received 1 application of 130 p.p.m. MH at periods ranging from 4 days before to 5 days after the start of short-day treatment. Effects of the treatment included inhibition of internode elongation, the growth of axillary buds, a decrease in the number of male inflorescences, an increase in the number of nodes with female inflorescences, a decrease in the number of female inflorescences per node and the formation of malformed male and female inflorescences. The effects were most marked when sprays were applied after the start of short-day treatment.

3718. Curtis, R. W.
Studies on response of bean seedlings and corn roots to malformin.
Plant Physiol., 1961, **36**: 37-43, bibl. 7, illus.

Malformin is a metabolic product of *Aspergillus niger*. Of 28 dicotyledons tested 20 responded to malformin application by stem curvature or enlargement; of 9 monocotyledons only 2 responded. On beans as little as 1×10^{-4} μg. per plant caused stem responses and 1×10^{-1} μg was the optimum dose. The malformin was translocated through the roots to the apical meristems. Seed soaking and leaf treatments were ineffective.—Purdue Univ., Lafayette, Ind.

3719. Haccius, B., and Massfeller, D.
Untersuchungen zur biologischen Aktivität der Phenylborsäure. **(Investigations on the biological activity of phenylboric acid.)** [English summary 12 lines.]
Planta, 1961, **56**: 174-88, bibl. 14, illus.

Ten applications of phenylboric acid (0·03 ml. of a 2×10^{-3} M solution) to *Kalanchoe* resulted in a reduction of the number of petals or their complete absence. One application at the same strength to cucumbers produced abnormal flowers and one or two leafless nodes. The first differentiation processes of the leaf primordia were selectivly inhibited by phenylboric acid.—Univ. Mainz.

3720. Halevy, A. H., and Cathey, H. M.
Effect of structure and concentration of some quaternary ammonium compounds on growth of cucumber seedlings.
Bot. Gaz., 1960, **122**: 151-4, bibl. 13.

A fuller account of the work recorded in *H.A.*, 30: 1563.

3721. Markin, B. T.
Synthesis of some thiourea derivatives and determination of their growth-promoting activity. [Russian, with English summary 6 lines.]
Fiziol. Rast., 1961, **8**: 86-91, bibl. 14, illus.

Three newly synthesized phenoxyethanethiuronium bromides were found to have an effect on root formation in bean seedlings approaching that of heteroauxin.

3722. Ernst, D.
A note upon the role of plant hormones in the establishment of fruit trees.
Agric. vet. Chemic., 1961, **2**(1): 35-6, illus.

The use of the proprietary compound Transplantone (a mixture of NAA, vitamins and trace elements) is described. Trees, at transplanting, are either dipped in, or watered with, a dilute solution of the mixture (80 g./100 l.), and it is claimed that regeneration of the root systems and growth of the tops of trees have been markedly increased in many orchards in southern France.

Pollen and nectar.

(*See also* 4494, 5015, 5108, 5165, 5308, 5384.)

3723. Rao, V. N. M., and King, J. R.
Pollination and pollen handling in horticultural crops.
Madras agric. J., 1960, **47**: 386-90, illus.

A review of modern practices.

3724. Santos, C. F. de O.
Anatomia dos nectários de algumas espécies da flora apícola. **(Nectary structure in some species of bee-pollinated flowers.)**
An. Esc. sup. Agric. Queiroz, 1959, **16**: 87-99, bibl. 18, illus.

Including *Citrus aurantifolia*, *Coffea arabica*, *Eruca sativa*, *Dolichos lablab*, *Ipomoea purpurea* and *Salvia splendens*.

3725. Lüttge, U.
Über die Zusammensetzung des Nektars und den Mechanismus seiner Sekretion. I. **(The analysis of nectar and the mechanism of its secretion. I.)**
Planta, 1961, **56**: 189-212, bibl. 65, illus.

Nectar was found to differ widely in composition. Various sugars, amino acids and dicarboxylic acids were found in different plants. The nectar of maple contains ureides, which are found in relatively high concentrations in other parts of the plant. Banana nectar contains protein derived from bacterial activity, and that of *Lathraea* contains tyrosinase. It was shown that nectar is a strongly buffered system. Translocation of $P^{32}O_4$ from the nectary to the conducting elements occurred during the secretion phase. Uridine diphosphate glucose was demonstrated in the nectary of *Abutilon*. Although the nectar of *Abutilon* was found to be hypertoxic to the cells of the nectary, they were not plasmolysed.

Packing, storage and marketing.

(*See also* 3799, 4012, 4025.)

3726. Produce Prepackaging Development Association.
Transparent packaging materials.
Res. Rep. Prod. Prepack. Dev. Ass. **1**, 1959, pp. 12 + graphs.

This is one of a series of reports which are being issued to members. Number 1 is a condensed report of results of preliminary tests to determine the shelf life and causes of deterioration of blackberries, spring onions, lettuces, cucumbers, tomatoes, carrots, brussels sprouts, cooked beetroot and watercress, when packed and held under specified conditions in polythene, cellulose acetate, regenerated cellulose and cotton net packages.

3727. Seary, P. G.
The effect of produce prepacking on farm mechanization.
Fm Mechaniz., 1960, **12**: 371-2, illus.

Since undamaged produce is necessary for prepacking, it will become increasingly important for the grower to select suitable varieties and to space the rows so that mechanical harvesting may be carried out with the minimum of damage. The use of bulk bins for fruit picking and of brushing and polishing equipment for apples, tomatoes and other crops is also recommended. New equipment for packing stations being developed includes bagging machines, washing, dry-brushing, peeling, drying and grading equipment. Reduction of damage during transport is reported with the increasing use of gravity conveyors, fork lift trucks and pallet handlers. Damage is also reduced by fluming in water channels and by the use of vibratory conveyors.

3728. Serini, G.
La conservazione della frutta, degli ortaggi e dei fiori in atmosfera confinata a bassa percentuale di ossigeno. Nota II. **(Storage of fruit, vegetables and flowers in a confined atmosphere with a low percentage of oxygen. Note II.)** [English summary 4 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 474-83, bibl. 12.

In the experimental chamber described in a previous article [see *H.A.*, 31: 111] strawberries were kept for 8 days, apricots and cherries for 9 days, and oranges for 105 days with very good results. Globe artichokes were kept for 21 days and beans for 11 days in excellent condition. With mimosa (*Acacia* sp.) the results were much better when the flowers had opened naturally than when they had been forced, and when mimosa was stored with unopened buds, and subsequently forced, only 50–60% flowering was obtained.

3729. Mrożewski, S.
Witamina C w surowcach i produktach owocowo-warzywnych oraz warunki jej zachowania. **(Vitamin C in fruit and vegetable raw materials and products, and conditions for its preservation.)** [English summary ½ p.]
Rolnictwo, 1957, No. 2, pp. 5-64, bibl. 39, illus., [received 1960].

Data are given for fresh, stored and processed fruit and vegetables. In tests it was found that the highest loss occurs during extraction of juice in the press, especially where fruit has less than 1% malic acid or a pH over 3·4. Descriptions are given of a thermal method for retention of vitamin C in fruit juice and a method of processing rose hips to retain 85% of their vitamin C.

3730. Guillou, R.
Coolers for fruits and vegetables.
Bull. Calif. agric. Exp. Stat. **773**, 1960, pp. 66, bibl. 31, illus.

Information is provided on the engineering aspects of types of cooler, cooling methods in rail cars, the design of cooling rooms, forced-air coolers and ice bunkers. Operating costs of the various cooling methods are given.

3731. Crabtree, G.
Mechanical handling at a fruit and vegetable market.
Agriculture, Lond., 1960, **67**: 472-3.

Fork-lift trucks, conveyors and cold storage equipment described.

3732. Friedman, B. A.
Market diseases of fresh fruits and vegetables.
Econ. Bot., 1960, **14**: 145-56, illus.

The various causes of market losses, mechanical, physiological and pathological, are analysed.

3733. Alvisi, F.
Costi di esportazione di prodotti ortofrutticoli. **(Costs of exporting vegetables and fruits.)**
Frutticoltura, 1960, **22**: 479-91.

Herbicides and weed control.

(*See also* 3797, 3810, 4365, 5455, 5457, 5553.)

3734. Ríos, P.
Importancia económica de los herbicidas. **(The economic importance of herbicides.)**
Ingen. agron., 1960, No. 4, pp. 20-2, illus.

Types for use in Venezuela on sugar cane and vegetables, with details of costs and savings in labour.

3735. Zemánek, J.
Příspěvek ke studiu herbicidů typů 2-(2,4-dichlorfenoxy) etylsíranu sodného. **(A contribution to the study of herbicides of the type sodium 2-(2,4-dichlorophenoxy) ethyl sulphate.)** [Russian, German and English summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 1137-46, bibl. 8, illus.

Tests with 6 herbicides on cucumbers and tomatoes confirmed that they are more active in the presence of non-sterile soils, and are practically ineffective when applied to the foliage. Herbicidal action was most active in compounds in which CH_3 or Cl was substituted for H at position 2 or at positions 2 and 4 in the ring.

3736. Wallis, J. A. N.
Observations on the use of certain chemicals to mark herbicides to be used on grass.
Pest. Abstr. News Summ., Sect. C, 1960, **6**(2/3): 52-4.

In the control of patches of couch grass (*Digitaria scalarum*) in coffee plantations dalapon was found to be applied unevenly by hand sprayers, often resulting in injury to the coffee trees. Experiments were conducted with various dyes for use as markers for assessing visually the amount of herbicide applied. Methylene blue at 1.000 p.p.m. gave the most satisfactory stain, persisting for the longest period.—Coffee Res. Stat., Ruiru, Kenya.

3737. Kurth, H.
Methoden zur Vorprüfung von Herbiziden. (**Methods for screening herbicides.**) [English and Russian summaries 25 lines each.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 230-6, bibl. 4.

Descriptions are given of 2 screening tests for herbicidal preparations, and also of the Chesterford logarithmic spraying machine with which field experiments on herbicides can be quickly and easily performed.

3738. Whiffen, H. J.
Modern herbicides can be applied with precision.
Comm. Gr, 1961, No. 3403, pp. 715-17, illus.

A home-made applicator is described which can be fitted to any sprayer for precision application of herbicides around trees and bushes. By means of adjusting screws amounts of from 1 fl. oz. to 1 pint can be applied with an accuracy of $\frac{1}{10}$ fl. oz.

3739. Fryer, J. D., Parker, C., and Woodford, E. K.
The spray-incorporating drill. A machine designed to improve the reliability of soil-acting herbicides.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5.

The equipment, in its present experimental stage, is designed to apply a herbicide, to incorporate it by means of a 9-in. wide rotary cultivator, to consolidate the loose soil with a roller to give a standard seedbed, and finally to sow seed with a precision drill. Tentative upper limits of application rates for soil-incorporated herbicides included: propazine at 1 lb./acre in carrots, endothal at 6 lb. + propham 4·5 lb./acre in red beets and CDEC and CDAA each at 8 lb./acre in turnips and swedes.—A.R.C. Weed Res. Org., Begbroke Hill Farm, Oxford.—From *Weed Abstr.*, **10**, No. 174.

3740. Wooten, O. B., McWhorter, C. G., and Ranney, C. D.
Underground application of chemicals studied.
Miss. Fm Res., 1960, **23**(6): 4-5, illus.

Fluorescent materials have been used at the Delta Branch Experiment Station, Stoneville, to study the placement of fungicides and herbicides in the soil. The fluorescent material used was a 1% suspension of zinc ortho silicate, which fluoresces yellow-green in both short- and long-wavelength UV light and is insoluble in water. The silicate was mixed with the fungicide or herbicide and applied to the soil by various methods and at various rates and depths. A pit was then dug and one side trimmed to allow observation and photography. The most promising method of applying herbicides underground was with a specially designed applicator, fitted with a fan orifice carried within a concave blade, used either alone or followed by a rotary hoe. Surface application followed by discing or rotary hoeing generally gave a poor distribution of the chemical. [See also *H.A.*, 30: 5238.]

3741. Edwards, F. E.
Better control of weeds with modified sweep.
Miss. Fm Res., 1960, **23**(11): 1, 8, illus.

The Mississippi Experiment Station has developed a knife coulter with a 6-inch V-shaped flattened basal plate suitable for cultivating close to row crops without covering the plants with soil or forming ridges. The tool is tractor-mounted, and in operation the basal plate is drawn horizontally through the soil at the desired depth loosening the soil and destroying weeds. When used in conjunction with a flame thrower, good weed control was achieved. Post-emergence chemicals are easily applied where the modified coulter has been used.

3742. Kates, A. H., and others.
Chemical weed control guide for Virginia.
Circ. Va Polytech. Inst. **728**, revised 1961, pp. 6.

Tabulated recommendations for weed control in tobacco, fruit, vegetables and ornamentals.

3743. Bagley, W. T., and Miyoshi, R. T.
Chemical weed control in windbreaks.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, p. 43.

In Nebraska by diuron, simazine and atrazine.—See *Weed Abstr.*, **9**, No. 1949.

3744. Berry, G. J.
Research and developments in aquatic weed control.
Proc. 12th annu. Calif. Weed Conf., 1960, pp. 75-8.

Amitrole or dalapon at 5–10 lb./100 gal. water at 400 gal./acre, applied in July–September, controlled *Typha* spp.; dalapon + amitrole or 2,4-D may also be used successfully. Granular forms show promise. Biological control has also been investigated; certain herbivorous fish, notably the Israeli carp, eliminate all rooted vegetation when stocked at 50 fish/acre.—*Weed Abstr.*, **10**, No. 297.

3745. Chancellor, R. J.
Results of some preliminary experiments on the use of pelleted herbicides for controlling submerged water plants.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 8, bibl. 5.

In trials in which a wide range of relatively insoluble pelleted herbicides were applied to small plots in flowing or nearly static water, no material gave satisfactory control of submerged aquatic weeds. The contrast between these and other results obtained in the U.S.A. is discussed.—A.R.C. Weed Res. Org., Begbroke Hill Farm, Oxford.—*Weed Abstr.*, **10**, No. 121.

3746. Lockley, G. J., and Turner, D. J.
The control of water hyacinth.
Bull. Dep. Agric. Minist. nat. Res. Tanganyika **1**, [1960], pp. 6, illus.

By 2,4-D amine at 3 lb./acre, usually applied as a high volume spray in 100–150 gal. of water.

3747. Rincón, D. J.
Control del corocillo o coquillo. **(Nutgrass control.)**
Ingen. agron., 1960, No. 4, pp. 23-30, bibl. 41, illus.

A review of foreign practice is followed by a description of Venezuelan trials, from which the following conclusions were drawn: (1) in recent infestations 95% of the rhizomes are within 20 cm. of the surface; (2) cultivation cuts up the rhizomes and increases the nutgrass population if carried out during the rainy season; (3) 2,4-D, CMU, TCA, dalapon and Weedazol did not give satisfactory control; (4) EPTC at 7·5–20·0 kg. per 800 l. per ha., applied in the dry season in 2 doses and immediately rototilled in, gave excellent control for 3 months; (5) haricot beans sown 3 weeks after treatment were not affected by 7·5 kg. EPTC or less.

3748. Welbank, P. J.
Toxin production from *Agropyron repens*.
Biology of Weeds, Symp. Brit. ecol. Soc., 1960, pp. 158-64, bibl. 2.

In experiments with kale, tomato and turnip plants [see also *H.A.*, 29: 3487] there was no evidence of any appreciable growth inhibition by the grass; sometimes growth was stimulated. Results of an experiment with *A. repens* root and rhizome residues indicated that, although there is no secretion of a toxin, growth inhibitors may arise from the decaying material in the soil.—Rothamsted exp. Stat.—From *Weed Abstr.*, **10**, No. 110.

3749. Bleasdale, J. K. A.
Studies on plant competition.
Biology of Weeds, Symp. Brit. ecol. Soc., 1960, pp. 133-42, bibl. 18.

Examples are given of the way in which the species, density, distribution and duration of weeds can affect the yield of some vegetable crops. Climatic and edaphic conditions are shown to have a modifying effect. It is concluded that plants can compete for the supply of nutrients, light or water either simultaneously or in rapid succession. Plant growth integrates this situation, thus justifying the use of plant weight as an index of competition. This enables competition to be defined and studied in quantitative terms.—Nat. Veg. Res. Stat., Wellesbourne.—*Weed Abstr.*, **10**, No. 98.

3750. Subramanian, C. L., and Srinivasan, A. R.
A review of literature on the phanerogamous parasites.
I.C.A.R. Monograph **10.24**, New Delhi, 1960, pp. 96, bibl. 15 pp., 4s. 3d.

Parasitic plants of 55 main genera are described, the more important with details of their distribution, life history, development and anatomy, hosts and control measures.

Plant protection.

(*See also* 3798, 3809, 3810, 3814, 4344, 4373, 4376, 4483, 4507, 4683, 4684, 4777, 4778, 5259, 5551, 5564, 5571, 5572.)

3751. Jung, J.
Über jahreszeitliche Schwankungen des Antibiotikagehaltes in Cambium und Rinde. **(Seasonal fluctuation of antibiotic content in the bark and cambium.)**
Naturwissenschaften, 1961, **48**: 134, bibl. 3.

Fungistatic and bacteriostatic substances isolated from the bark of 12 species of trees showed marked seasonal variation. Extracts from poplar bark were tested on cultures of *Dothichiza populae*. From June to August 0·1–0·5 mg./ml. of crude extract produced an inhibition zone of 16 mm.; from September to October the inhibition zone with 0·5 mg./ml. was 10 mm. and from November to May with 5·0 mg./ml. it was only 4 mm. Three different antibiotics have been extracted from poplar bark.—Forstbot. Inst., Munich.

3752. Flores, M. A.
Introducción a la patología forestal. **(An introduction to the pathology of trees.)**
[*Publ.*] *Univ. San Carlos Guatemala, Fac. Agron.*, 1959, pp. 40, bibl. 9, illus.

The diseases and their control are classified mainly according to causes and effects: fungi, physiological disturbances, bacteria, viruses, seed diseases, root diseases, leaf diseases, trunk cankers, wood staining and deterioration, and parasitization by mistletoe. Trunk rusts of conifers are treated separately. Species and genera briefly referred to in the text include *Rubus*, *Ribes*, walnut, pecan, almond, chestnut, coffee, cinchona, citrus, mango and *Liquidambar*.

3753. GUDAUSKAS, R. T.
Plant viral infections as influenced by extracts from some known or suspected hosts of stone-fruit viruses.
Diss. Abstr., 1960, **21**: 1323-4, being *L.C. Card No. Mic.* 60-3925 of 72 pp.

Extracts from young and mature leaves of *Rosa multiflora*, from mature leaves of cherry, chokecherry (*Prunus virginiana*) and peach, from peach stems, and from roots of cherry, chokecherry and peach inhibited infection of pinto bean leaves by tobacco mosaic virus in varying degrees. The infection of cucumber cotyledons by cherry ringspot virus was strongly inhibited by extracts from mature leaves of chokecherry, and slightly inhibited by extracts from mature leaves of cherry, peach and multiflora rose.—Univ. Ill.

3754. SIJPESTEIJN, A. K.
New developments in the systemic combat of fungal diseases of plants. [Dutch summary 6 lines.]
Tijdschr. PlZiekt., 1961, **67**: 11-20, bibl. 39.

A review.

3755. TORGESON, D. C.
The fungicidal activity of (aminoalkyl) pyrenes.
Contr. Boyce Thompson Inst., 1961, **21**: 21-6, bibl. 8.

These substances were found to be active fungicides when tested in the control of tomato early blight (*Alternaria solani*), bean powdery mildew (*Erysiphe polygoni*) and apple powdery mildew (*Podosphaera leucotricha*). Pyrene was active only against the powdery mildews. *N*-methyl-I-pyrenemethylamine was the most effective compound for early blight control and *N,N*-dimethyl- and *N,N*-diethyl-I-pyrenemethylamine hydrochloride were the best for powdery mildew control. In general, activity decreased as the *N*-alkyl chain was lengthened. Phytotoxicity was particularly severe among the more active compounds. [From author's summary.]

3756. TORGESON, D. C., HENSLEY, W. H., AND LAMBRECH, J. A.
Polyaracyclic methylmercaptoimidazolines as foliage fungicides.
Contr. Boyce Thompson Inst., 1961, **21**: 27-31, bibl. 18.

Control of early blight of tomato, powdery mildew of bean and powdery mildew of apple was used to study the fungicidal effectiveness of these substances. The 2 most active compounds studied were 2-(3-fluoranthenylmethylmercapto)imidazoline hydrochloride and 2-(9-phenanthrylmethylmercapto)imidazoline hydrochloride. The free bases were less toxic. Anthracene, pyrene and naphthalene derivatives were poorer fungicides than the fluoranthene and phenanthrene derivatives. [From authors' summary.]

3757. DEKKER, J.
Systemic activity of procaine hydrochloride on powdery mildew. [Dutch summary ½ p.]
Tijdschr. PlZiekt., 1961, **67**: 25-7, bibl. 1, illus.

Procaine hydrochloride was active against the development of mildew (*Erysiphe cichoracearum*) on cucumber leaves when applied to the leaves or roots soon after inoculation. Foliar applications were also effective against *Erysiphe polygoni* on beetroots, peas and lupins, against *Sphaerotheca pannosa* on roses, and against *Podosphaera leucotricha* on apples. The material appears to act specifically against powdery mildews.—Lab. Fytopath., Wageningen.

3758. HELLMERS, E.
Kransskimmel eller *Verticillium*-hadromykose (*Verticillium albo-atrum* Reinke & Berthold og *V. dahliae* Klebahn). (**Verticillium wilt. *Verticillium albo-atrum* and *V. dahliae*.**)
Horticultura, 1961, **15**: 19-28, bibl. 43, illus.

A review of life-history and control.

3759. TALIEVA, M. N.
Concerning the reaction of plant tissues to phytotoxins. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 61-6, bibl. 7, illus.

Toxins extracted from 10-day cultures of *Fusarium*, *Rhizopus* and *Botrytis* spp. were tested on leaves of apricot and apple in a moist chamber in darkness and in the light. The intensity of the necrosis was found to be inversely related to the rate of photosynthetic activity of the tissue; when the leaves were illuminated growth of the necrotic spots was arrested. Histochemical investigations showed that the ascorbic acid content fell in tissue treated with toxin and that the activity of the oxidizing enzymes peroxidase, cytochrome oxidase and polyphenoloxidase increased.

3760. TORGESON, D. C., AND HAYNES, H. L.
Nematocidal properties of diphenyl sulfide.
Contr. Boyce Thompson Inst., 1961, **21**: 11-19, bibl. 6.

In laboratory and preliminary field tests diphenyl sulphide was as effective as Nemagon, Vapam, Mylone and ethylene dibromide, and more effective than D-D and PRD, when evaluated against *Meloidogyne* sp. and *Panagrellus redivivus*, using cucumber and tomato as indicator plants. Diphenyl sulphide is slow acting, has a low vapour pressure and consequently must be intimately incorporated with the soil. As it is toxic to seeds and seedlings it must be used 1 to 2 weeks prior to planting.

3761. SCOGNAMIGLIO, A.
Due nuovi nematocidi. (**Two new nematicides.**)
Ital. agric., 1961, **98**: 270-4.

The American chemical N.S.18,133 (*O,O*-diethyl *O*-2-pyrazinyl phosphorothiate) may be applied to the soil at any convenient time during the 3 weeks before sowing or transplanting. It has given good control of nematodes in tobacco crops, particularly on sandy soils. It should be worked fairly deeply into the soil because its action requires moisture. Preliminary observations on its toxicity to crops indicate that it should not be used at rates above 22 kg. of active substance per ha., and that tolerant crops include tobacco, tomatoes, onions, cucumbers, lettuces, radishes, strawberries, peonies, citrus, vines, peaches and coconut palms. As well as controlling various nematodes this product has proved effective against onion flies (*Hylemyia antiqua*), carrot flies (*Psila rosae*) and some species of *Pseudococcus*. Its toxicity to man and animals is similar to that of parathion. The nematicide E.N. 28,450 (2-allithio-2-thiazoline) proved effective against *Meloidogyne* spp. in tobacco soils in an experimental 5% granular form applied at 12–34 kg./ha., without injury to seedlings transplanted immediately or 7 days after application. Citrus crops, however, were injured at moderate rates of application.

3762. (Birchfield, W.)
Nematodes have another enemy.
Agric. Res., Wash., 1960, 9(5): 11.

In laboratory and greenhouse trials the fungus *Catenaria vermicola* was found to attack root knot, sting, sheath, dagger, lance, ring, meadow, citrus and stunt nematodes. *C. spherocarpa* also killed root knot nematodes of tomatoes, and *C. anguillae* was parasitic on a number of nematodes. Plants are not thought to be harmed by this fungus.—La agric. Exp. Stat.

3763. Batth, S. S.
The toxicology of new miticides.
Diss. Abstr., 1960, **21**: 995-6, being *L.C. Card No. Mic.* 60-4061 of 64 pp.

The effective concentrations and residual actions of Tedion, ethion, Guthion, Kelthane and thiodan were evaluated, using *Tetranychus telarius*. In addition, the effect of Tedion in inducing mite sterility was studied [see also *H.A.*, 30: 678].—Ohio St. Univ.

3764. Desmoras, J., Fournel, J., and Metivier, J.
Activités acaricide et insecticide au laboratoire et en serre d'un nouvel ester phosphorique: l'éthion ou 8.167 R.P. (**Acaricidal and insecticidal effects in laboratory and greenhouse trials of a new phosphoric ester, ethion or 8,167 R.P.**)
Phytiat.-Phytopharm., 1960, **9**: 75-85, bibl. 5.

Three-year trials showed ethion at 60 g. active ingredient per hl. to be an excellent acaricide with a very good contact effect on all mobile forms of the greenhouse red spider mite, good ovicidal properties and a residual effect for 12 days. It also had contact-insecticidal properties, especially on aphids. Its mammalian toxicity was 4-10 times less than that of parathion.—Soc. Usines chim., Rhône-Poulenc.

3765. Cessac, M.
Efficacité en plein champ d'un acaricide nouveau: l'éthion (8.167 R.P.). (**Efficacy in the field of a new acaricide, ethion (8.167 R.P.).**)
Phytiat.-Phytopharm., 1960, **9**: 87-94.

In a 3-year trial ethion at 60 g. active ingredient per hl. and 1,000 l. per ha. gave effective control of mobile forms of *Metatetranychus ulmi* on apple and *Tetranychus urticae* on bean, and also had good ovicidal properties. Its residual effect lasted about 3 weeks. It gave moderate control of aphids when applied alone at 60 g. a.i. per hl. and excellent control when applied in combination with endothion, each at 30 g. a.i. per hl. Its toxicity to predators was very low.—Soc. Usines chim., Rhône-Poulenc.

3766. Džolova, N. G., Antonova, I. I., and Nalivajko, A. G.
Chemicals for control of spider mites: on vegetables and soft fruits (dithiophos); on ornamentals (octamethyl and ether sulphonate); and on roses (methylmercaptophos). [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(2): 35-7.

Three short papers describe the control of *Tetranychus urticae* on several plants.

3767. Graham, C. W.
Red spider mite under glass.
Agriculture, Lond., 1960, **67**: 452-6, bibl. 7.

The establishment of *Tetranychus telarius* in the glasshouse is discussed. Failure to gain complete control by means of chemical sprays and smokes may be due to inefficient application, leaking glasshouses or the development of resistant strains. Notes are given on the application and success of systemic acaricides.

3768. Eichmeier, J., and Guyer, G.
An evaluation of the rate of reproduction of the two-spotted spider mite reared on gibberellin-treated bean plants.
J. econ. Ent., 1960, **53**: 661-4, bibl. 9.

The rate of reproduction of two-spotted spider mites, *Tetranychus telarius*, was low on bean plants treated with gibberellin, but rose rapidly and became almost normal when these mites were returned to untreated plants. Mites raised on untreated plants and transferred to treated plants showed a drop in reproduction within one generation. [From authors' abstract.]—Mich. St. Univ., East Lansing.

3769. Rodriguez, J. G., Maynard, D. E., and Smith, W. T., Jr.
Effects of soil insecticides and absorbents on plant sugars and resulting effect on mite nutrition.
J. econ. Ent., 1960, **53**: 491-5, bibl. 10.

The effects of DDT and various absorbents as soil additives on the composition of Black Valentine beans and on *Tetranychus telarius* populations developing thereon were investigated in the greenhouse. Treatments included DDT at 800 and 1,600 lb. per acre, alone or in combination with 8 absorbent materials. DDT added to the soil at both rates increased total and reducing sugars, N and *T. telarius* populations, while decreasing P, K and dry weight of foliage. Addition of the activated carbons Hydrodarco B, Aqua Nuchar A and Nuchar C-115-A generally restored the chemical components of the beans and also the mite populations to the levels of the untreated controls. Mite populations were thus correlated positively with reducing sugar and N and, in some cases, with total sugar, and negatively with P and K percentages and dry weight of foliage. Peat moss, calcium hydroxide and Fisher activated charcoal were ineffective absorbents; Norit-A and Mallinckrodt activated charcoals alleviated the phytotoxic effects of DDT but did not influence mite populations consistently. [For earlier work in this series, see *H.A.*, 28: 1451 and 29: 282.]—Univ. Ky, Lexington.

3770. Rodriguez, J. G., Chen, H. H., and Smith, W. T., Jr.
Effects of soil insecticides on apple trees and resulting effect on mite nutrition.
J. econ. Ent., 1960, **53**: 487-90, bibl. 8.

Young apple trees were grown in 1956 and 1957 in cans of soil treated with several levels of DDT, dieldrin and BHC, and in 1956 also with a granulated 10–10–10 fertilizer at 500 lb. per acre. Females of *Panonychus ulmi* and *Tetranychus telarius* were cultured on detached leaves and their progeny were counted; tree responses were measured and the foliage was analysed for N, P and K. Root weight was reduced by all treatments in 1956, significantly so by dieldrin. In 1957 DDT at 100 lb. per acre increased root weight. BHC and dieldrin slightly depressed twig growth. On fertilized soil in 1956 DDT at 100 lb. per acre raised the amount of absorbed P to 0·32% and depressed the populations of both mite species, but at 1,000 lb. it increased both populations. On unfertilized soil in 1957 DDT at 100 and 4,000 lb. per acre increased both the leaf N content and the mite populations. That year the amount of absorbed P generally fell to below 0·20% and was positively correlated with *T. telarius* populations, whereas the relationship between these two in the previous year was generally negative. Dieldrin at 50 lb. per acre increased *T. telarius* populations and at 500 lb. depressed both species. BHC depressed *T. telarius* populations only, at both the 20 and 200 lb. levels. [See also preceding abstract.]—Univ. Ky, Lexington.

3771. Baker, E.
Dimecron fulfils its early promise on apples.
Grower, 1961, **55**: 978-9.

Recommendations for commercial use on apples and hops to control insects and mites.

3772. Coppola, S.
Gli insetticidi selettivi e la lotta biologica. **(Selective insecticides and biological control.)**
Tecn. agric., 1960, **12**: 537-42.

Schradan is practically non-toxic to useful insects. Both C.R. 409 and Isopestox are highly toxic to useful insects, even 64 hours after application. If systemic insecticides were applied to the soil in the region of the roots of plants to be treated, they would be more effective against pests and less harmful to useful insects, but the cost would be greater than for foliar spraying.

3773. Beye, F.
Die Wirkung von Insektizidemulsionen auf die mit Aceton-Petroläther extrahierbaren Anteile von Coleussprossen. **(The effect of insecticide emulsions on the acetone-petrol-ether extractable fractions of coleus shoots.)**
Angew. Bot., 1961, **34**: 246-58, bibl. 26.

A study of the absorption and decomposition of insecticide emulsions applied basally to cut shoots, and their effects on the metabolism of the plant. [See also *H.A.*, 31: 1830.]

3774. Bardner, R.
Effect of formulation on toxicity to plants and insects of some systemic insecticidal seed dressings.
J. Sci. Food Agric., 1960, **11**: 736-44, bibl. 14.

Various seeds, including mustard, were treated with dressings containing certain systemic insecticides and various stickers and fillers. Activated carbon, polyvinyl acetate emulsion and a chlorinated diphenyl resin lessened the toxicity of the insecticides to seedlings grown in sand. Polyethylene glycol ethers and polyvinyl alcohol solution also had some effect. Carbon and polyvinyl acetate prolonged the period of systemic action of "Thimet" against the mustard beetle *Phaedon cochleariae* and the bird-cherry aphid *Rhopalosiphum padi.* Mustard plants grown from seed treated with γ-BHC formulated with these materials were slow to attain their maximum insecticidal activity. These effects are attributed to the initial absorption of insecticide by the sticker or filler and its subsequent slow release. [From author's abstract. For earlier work, see *H.A.*, 29: 3677.]—Rothamsted exp. Stat., Harpenden, Herts.

3775. WESTCOTT, C. (EDITOR.)
Biological control of plant pests.
Plants and Gdns, 1960, **16**: 1-97, illus.

Among the articles included in this interesting issue are those on the natural enemies of coccids, aphids and nematodes, on biological control by many insects including ladybirds, hymenopterous species and mantids, and control by microbial insecticides and by sterilization of the males by gamma rays.

3776. JØRGENSEN, J.
Oldenborrerne. *Melolontha melolontha* L. og *M. hippocastani* Fabr. **(The cockchafers *Melolontha melolontha* and *M. hippocastani*.)** [English summary 5 pp.]
Tidsskr. Planteavl, 1960, **64**: 614-87, bibl. 44, illus.

The behaviour of cockchafers in Denmark was studied. An attempt at large-scale control by aerial spraying showed spectacular initial results, but final efficiency has not yet been evaluated. Root dipping of strawberry plants and young conifers in a BHC or lindane mixture was phytotoxic, but chlordane was not harmful and did protect young plants from larval attacks. In laboratory experiments on biological control *Bacillus popilliae* killed the larvae when injected, but failed to infect larvae via the soil.

Chemical residues and their analysis.

(*See also* 4338, 4342, 4377, 4632, 5239, 5240.)

3777. NANGNIOT, P.
La polarographie appliquée au dosage de petites quantités de fongicides ou d'insecticides en dépôts ou en résidus sur plantes cultivées. I. Le dosage polarographique du soufre élémentaire résiduaire. II. Les dérivés de l'acide dithiocarbamique. 1. Le diméthyldithiocarbamate de zinc (Ziram). 2. Le diméthyldithiocarbamate ferrique (Ferbam). 3. L'Éthylène-bisdithiocarbamate de zinc (Zineb). **(The application of polarography to the determination of small quantities of fungicide or insecticide deposits or residues on cultivated plants. I. The polarographic determination of residual elemental sulphur. II. The derivatives of dithiocarbamic acid. 1. Zinc dimethyldithiocarbamate (ziram). 2. Ferric dimethyldithiocarbamate (ferbam). 3. Zinc ethylene-bisdithiocarbamate (zineb).)**
Bull. Inst. agron. Gembloux, 1960, **28**: 276-86, bibl. 6; 365-72, bibl. 4; 373-80, bibl. 4; 381-8, bibl. 5.

The theory of the method and examples of residue values obtained: recovery values were generally very high.

3778. FISCHER, W., AND UHLICH, U.
Infrarotspektrographische Bestimmung von Malathionrückständen auf Kohlrabi, Blumenkohl und Salat. **(Infra-red spectrographic determination of malathion residues on kohlrabi, cauliflower and lettuce.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1961, **13**: 28-30, bibl. 9.

The lower limit of the method is 2–4 p.p.m.

3779. KLEE, O., AND STEINER, P.
Arbeiten über Rückstände von Pflanzenschutzmitteln auf oder in Erntegut. VII. Insektizidrückstände bei Möhren und Futterrüben nach Behandlung mit organischen Phosphorverbindungen oder chlorierten Kohlenwasserstoffen. **(Studies on spray residues in or on the harvested crop. VII. Insecticide residues on carrot and fodder beet after treatment with organic phosphorus compounds or chlorinated hydrocarbons.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1961, **13**: 33-8, bibl. 14.

Methods of extraction, purification and biological estimation using *Drosophila* males. [For part VI see *H.A.*, 31: 770.]

Experimental techniques.

(*See also* 3669, 3707, 3737, 3847, 3945, 3953, 4265, 4329, 4397, 4703, 4773, 4828, 4840, 4841, 5254, 5255, 5302, 5316, 5412, 5585.)

3780. BARLOW, H. W. B., HANCOCK, C. R., AND LACEY, H. J.
An artefact in a coleoptile straight growth assay method.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 72-6, bibl. 8.

When solutions containing phloridzin, which had been in contact with wheat coleoptile sections for the standard test period, were re-tested with fresh coleoptile sections, this batch of sections showed a marked general flaccidity, which differed from the type of flaccidity limited to the ends of the sections. This type of damage happened only when small closed tubes were used in the bioassay and not when open tubes were used. The phenomenon was traced to a disturbance of the oxygen/carbon dioxide balance caused by microbial activity and could be prevented by sterilizing the solutions before re-testing them. For contamination to develop in the solution coleoptile exudate or juice was necessary as well as phloridzin.

3781. CROSBY, D. G., BERTHOLD, R. V., AND SPENCER, R., JR.
Naturally occurring growth substances. II. An improved straight growth test and its applications.
Plant Physiol., 1961, **36**: 48-51, bibl. 14.

Forkedeer proved to be the best oat variety for the bioassay of growth substances. No indole-3-acetic acid was found in extracts of young Alaska pea plants, although other unidentified stimulants were detected.—Union Carbide Chem. Co., S. Charleston, W. Va.

3782. Schachtschabel, P.
Die Bestimmung des Kalium-, Phosphor- und Stickstoffgehaltes von gärtnerischen Erden. **(The determination of potassium, phosphorus and nitrogen contents of garden soils.)**
Gartenwelt, 1961, **61**: 12-13.

A comparison of methods of analysis is presented, together with tabulated optimum values for NPK, pH and salinity, expressed as % KCl, for a number of garden plants.

3783. Bradford, G. R., and Pratt, P. F.
Separation and determination of lithium in irrigation water, plant material, and soil extracts.
Soil Sci., 1961, **91**: 189-93, bibl. 9.

The method is described. Values of 0·5 and 0·75 p.p.m. were obtained for citrus leaves and 8·25 and 5·5 p.p.m. for chard [spinach-beet].

3784. Wager, H. G., and Isherwood, F. A.
Silica gel chromatography of organic acids from plant tissue.
Analyst, 1961, **86**: 260-6, bibl. 14.

The method is described, with an example giving data on maturing pea seeds.—Low Temp. Res. Stat., Cambridge.

3785. Pánczél, M., and Eifert, J.
Die Bestimmung des Zucker- und Stärkegehaltes der Weinrebe mittels Anthronreagens. **(The determination of sugar and starch contents in vines by means of the anthron reagent.)** [English, French and Spanish summaries 14 lines each.]
Mitt. Klosterneuburg, *Ser. A*, 1960, **10A**: 102-10, bibl. 27.

3786. Davignon, L.
Comparaison de quelques méthodes de dosage des composés pectiques. **(A comparison of some methods of determining pectic compounds.)** [English, German, Spanish and Russian summaries about 10 lines each.]
Fruits d'Outre Mer, 1960, **15**: 469-72, bibl. 14.

Three methods were used to determine pectic compounds in Calville apples and the results were compared with those of a standard method (i.e., the determination of calcium in the calcium pectate precipitate). It was found that weighing the pectate precipitate gave too high an estimate, but the acidimetric determination of pectic acids and the colorimetric determination of carbazol gave results very similar to the standard method.—Stat. exp. Froid, Bellevue, C.N.R.S.

3787. Catlin, P. B.
Biochemical studies in fruit development.
Calif. Agric., 1961, **15**(5): 15.

A note to the effect that the enzyme system associated with the oxidation of the organic acids involved in respiration can be isolated from enzymes causing browning in particles of apricot fruits by buffering the particles in strong alkali and then subjecting them to differential centrifugation.

3788. Sapožnikov, D. I., and Černomorskij, S. A.
The extraction of chlorophyll from leaves by a mixture of polar and non-polar solvents. [Russian, with English summary 9 lines.]
Fiziol. Rast., 1960, **7**: 660-4, bibl. 8.

Mixtures of ethanol (polar) and petroleum ether (non-polar) were used for the extraction of chlorophyll from 40 plant species, many of them of horticultural interest. The curves of chlorophyll extraction plotted against the percentage of ethanol in the solvent showed a discontinuity, which occurred over a wide range of concentrations in different plants and is regarded as indicating similar variations in the amount of surface-active agents present in the leaves.

3789. Černomorskij, S. A.
The effect of ultrasonic vibration on the extraction of chlorophyll from leaves by a non-polar solvent. [Russian.]
Bot. Žurnal, 1960, **45**: 1696-7, bibl. 18.

Leaf disks of 20 species, including many ornamentals, in petroleum ether solvent were subjected to ultrasonic vibration of 500 kc/s for 10 min. From 13 species 21·5 to 51% of the total chlorophyll was extracted by the ultrasonic treatment but very little by the solvent alone. From the remaining 7 species no chlorophyll was extracted by the ultrasonic treatment. The possible reasons for these results are discussed.

3790. Ladefoged, K.
A method for measuring the water consumption of larger intact trees.
Physiol. Plant., 1960, **13**: 648-58, bibl. 24, illus.

The method consists of determining the time (*t*) taken for the sap stream to convey a temperature increase (caused by passing short waves from a diathermy apparatus through the trunk) to a point 5, 10 or 20 cm. higher up the stem. Direct measurements of water consumption were made by sawing-off the tree under water and these values were calibrated with *t*. From the curve so obtained water consumption rates for intact trees could be found. It was found that an inverse, or very nearly inverse relationship exists between the *t* values and the water consumption. The method is considered to be more accurate than any previously used for the measurement of water consumption by large, intact trees.—Municip. Forest Dist., Aarhus, Denmark.

3791. Filippov, L. A.
A refractometric method for estimating the water content of apples leaves. [Russian, with English summary 6 lines.]
Fiziol. Rast., 1961, **8**: 138-40, bibl. 4.

The method, designed to be used under field conditions, is based on the high negative correlation found between the cell sap concentration and water content of apples leaves.

3792. Bartoš, J., Kubín, Š., and Šetlík, I.
Dry weight increase of leaf disks as a measure of photosynthesis. [Czech and Russian summaries ½ p. each.]
Šetlík, I., Bartoš, J., and Kubín, Š.
Photosynthesis in leaf disks as a measure of photosynthetic capacity in crop plants. [Czech and Russian summaries ½ p. each.]
Biol. Plant., Prague, 1960, **2**: 201-15, bibl. 16, illus., and 292-307, bibl. 16.

In the first paper a method is described by which the increase in dry weight due to carbon assimilation in isolated leaf disks is ascertained. The disks are kept turgid under controlled conditions of light intensity, air humidity, temperature and CO_2 content. The second paper gives results showing that the method can be used successfully for determining the photosynthetic rate of leaves of a variety of crop plants, including brassicas and cucurbits.—Slov. Acad. Sci., Košice.

3793. Slepjan, E. I., and Kiškovskij, A. J.
X-ray method of studying leaf morphology. [Russian.]
Bot. Žurnal, 1960, **45**: 695-703, bibl. 67, illus.

A method and apparatus are described by which X-ray pictures of fresh or dried detached leaves may be taken. Greater contrast of the veins is obtained if the petioles are previously immersed in a 15–20% solution of potassium iodide for 2–3 hours. Many trees and shrubs have been used in studies of leaf morphology and leaf development. Studies were also made of variation in leaf form in relation to ecological factors, and of *Begonia* leaves in relation to polyploidy.

3794. Genkel', P. A., and Cvetkova, I. V.
The use of gravel culture for the study of soil and atmospheric drought. [Russian, with English summary ¼ p.]
Fiziol. Rast., 1960, **7**: 610-15, bibl. 9, illus.

Tomatoes were grown in gravel-filled pots which could be easily placed in and removed from glass vessels containing nutrient solution. This method facilitated studies on the physiology of drought resistance.

3795. Stone, J. F., and Mulkey, J. R., Jr.
Pliable, root-permeable layers for separation of portions of experimental plant root systems.
Science, 1961, **133**: 329, bibl. 4.

Composed of a mixture of equal parts of paraffin wax and rosin, the layer permits root penetration but is impermeable to water and ions, and may be used to separate different regions of the rooting medium round the roots of a growing plant.

3796. Stankov, N. Z.
Methods for determining the length of plant roots. [Russian, with English summary 10 lines.]
Fiziol. Rast., 1960, **7**: 736-9, bibl. 6, illus.

Soil samples are taken from different depths under growing plants with a specially constructed auger of 50 c.c. capacity. From the length and weight of the roots contained therein, the extent of the root system of a plant can be determined.

3797. Foy, C. L.
The adaptation of qualitative and quantitative techniques for determination of radioactive dalapon in plant tissues.
Hilgardia, 1960, **30**: 153-73, bibl. 24, illus.

The techniques of autoradiography, extraction and fractionation, counting and paper-partition co-chromatography were effectively combined, thus permitting qualitative and quantitative determination of distribution patterns and, to some extent, of the metabolic fate of translocated herbicides. [From author's abstract.]

3798. Ashworth, R. de B., and Lloyd, G. A.
Laboratory and field tests for evaluating the efficiency of wetting agents used in agriculture.
J. Sci. Food Agric., 1961, **12**: 234-40, bibl. 6.

A modified Shapiro's cotton tape test (a test dependent on the wetting of a cotton tape of standard weave) was a satisfactory laboratory method for testing the wetting properties of anionic and non-ionic wetters used with agricultural sprays at high volume. It was shown that the concentration of a wetter which wets a standard length of cotton tape in 15 sec. is related to the degree of wetting of a cabbage leaf. [From authors' summary.]—Plant Path. Lab., Harpenden, Herts.

Practical and research equipment.

(*See also* 3632, 3651-3653, 3737-3739, 3741, 3795, 3973, 4005, 4007, 4021, 4022, 4024, 4067, 4184, 4294, 4325, 4356, 4379, 4380, 4398, 4419, 4621, 4732-4735, 4798, 4799, 4970, 5022-5024, 5130, 5207, 5208, 5418, 5458, 5519.)

3799. The Commercial Grower.
Mechanisation survey.
Comm. Gr, 1961, No. 3400, pp. 475-95, illus., and No. 3401, pp. 571-87, illus.

Among the articles included in this survey are the following: Modern thoughts on smallholding equipment, by J. S. Wolfe; Developments of hydrocooling, by L. T. Vine; Mist propagation, its development and technique, by W. G. Krause; and an article on special machines and standardisation which has improved efficiency on a nursery producing bedding plants.

3800. LAKE, J. V.
A comparison between small flower pots made of clay or plastics.
J. agric. Engng Res., 1961, **6**: 64-71, bibl. 9.

Pots were compared on the basis of their effects on soil temperature, water loss and the growth of tomato plants. Under the conditions of the experiments, which were similar to those often used in the commercial production of tomato plants in heated glasshouses, the average difference in soil temperature in the absence of direct sunlight was only 0·6° C. The water loss from plastic pots varied between 35 and 80% of that from clay pots, depending on the conditions and on the physical properties of the clay used. The two kinds of clay pot tested had widely different properties; the one losing less water by evaporation took up water from the wet grit on the bench surface. With daily watering and using personal judgement as to the quantity applied, the coefficient of variation of tomato growth was less in plastic than in clay pots, but with more accurate daily watering both coefficients were greatly reduced and the difference between them was no longer significant. The growth, measured as dry weight, of tomato plants in plastic pots was 20 to 50% greater than that of plants in clay pots, depending on the accuracy of watering and on the drainage arrangements. [Author's abstract. See also *H.A.*, 31: 168.]—N.I.A.E., Silsoe, Beds.

3801. ANON.
£68 mobile potting bench saves ½d. per pot.
Grower, 1961, **55**: 754, illus.

A potting bench is mounted on a trolley, so that it can travel down a glasshouse gangway during potting, and the potted plants can be placed directly on the staging.

3802. SYNMEER, D. JA.
The use of hole diggers. [Russian.]
Sadovodstvo, 1960, No. 9, pp. 31-3, illus.

The larger of the 2 machines described drills planting holes 30, 60, 80 or 100 cm. in diameter and up to 80 cm. deep at a rate of 100 per hour.

3803. LISTOPAD, G. E., AND VAKULIN, A. A.
A new lifting implement. [Russian.]
Sadovodstvo, 1960, No. 9, pp. 34-5, illus.

For nursery trees.

3804. GAPONOV, E. P.
Simple equipment for erecting posts. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(6): 44-6, illus.

A tractor-mounted appliance for driving large wooden or ferroconcrete trellising stakes into the soil.

3805. (CAVE, F.)
Neat orchard mower made for less than £25.
Fmr and Stk-Breed., 1961, **75**(3709): 74, illus.

A low, self-propelled, rotary-type mower for use in orchards with overhanging branches.

3806. CESARI, C.
Alcuni tipi di carri-raccolta impiegati nelle aziende frutticole ferraresi. **(Some types of harvesting trailer used on fruit farms in the Ferrara province.)**
Inf. Ortofruttic., 1960, **1**: 195-8, illus.

Tractor-drawn trailers with platforms, mostly at different levels, are described. One of these, still in the experimental stage, has a horizontal gangway which can be rotated and moved up or down on a strong vertical pipe.

3807. NICHOLAS, R. C.
Some observations on the use of fruit pressure testers.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 312-26, bibl. 6, illus.

Pickled cucumbers, apples and polyurethane sheets were used in comparisons of firmness measurements made by a Magness-Taylor fruit pressure tester (FPT) and a mechanical recording pressure tester (MRPT) [see *H.A.*, 31: 1876]. Results obtained with the FPT varied with the individual operator. Comparisons of the variance of the force readings obtained by individuals using an FPT with the variance obtained by an MRPT showed discrepancies depending on the product tested.

3808. ROMANI, R. J.
Electronic devices to detect fruit maturity.
Calif. Agric., 1961, **15**(1): 3.

The amounts of light of different wave lengths passing through whole peaches, nectarines and plums, measured with an adapted spectrophotometer, appear to vary with fruit maturity. It seems possible to use this property for the rapid separation of fruits into several categories of maturity. [See also *H.A.*, 29: 3285.]—Univ. Calif., Davis.

3809. KOCH, H.
Anerkannte Pflanzenschutzgeräte und -geräteteile. (Auszüge aus den Prüfungsberichten 1959.) **(Approved equipment for plant protection. (Extracts from the 1959 report on testing.))**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1960, **12**: 145-51, illus., and 1961, **13**: 2-7, illus.

Details of the mechanism, efficiency and price of each piece of equipment are given. A large machine for hop spraying, 13 smaller sprayers, 5 low-volume spray machines, 2 fumigation devices and 3 frost protection oil heaters are described.

3810. Yates, W. E., and Ashton, F. M.
Logarithmic dosage sprayer.
Agric. Engng, St. Joseph, Mich., 1960, **41**: 436-8, 442, bibl. 6, illus.

The general design criteria, critical components, construction, calibration and operation of the sprayer are discussed, and data are presented from a trial on its use for herbicide application.

3811. (Borthwick, H. A.)
Beltsville's bright light room helps unveil plant mysteries.
Flor. Exch., 1961, **136**(5): 18, 25.

A plant room at Beltsville is described in which the effects of high light intensities (both incandescent and fluorescent) on plant life are being studied.

3812. Dubash, P. J., and Khan, B. A.
A simple apparatus for measurement of seedling growth under controlled temperature.
Bot. Gaz., 1960, **122**: 150-1, bibl. 2, illus.

The apparatus, constructed from Pyrex glass, consists essentially of an outer cylindrical jacket surrounding a thistle funnel which contains the growing seed. Water at the desired temperature circulates between the funnel and the jacket. It has been possible to maintain the temperature within ±0·5° C. The technique has been used to obtain values for growth optima, Q_{10}, etc., in *Cicer arietinum*.—Inst. Sci., Bombay.

3813. Belikov, P. S., Motorina, M. V., and Kurkova, E. B.
An experiment with an infrared gas analyzer (GIP-5) for the determination of the intensity of photosynthesis. [Russian, with English summary 3 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 3, pp. 30-9, bibl. 18, illus.

In experiments on beans and tomatoes the apparatus proved very satisfactory for measuring the rates of photosynthesis and respiration of attached leaves.

3814. Staniland, L. N.
Simple daylight detectors for the examination of fluorescent traced sprays.
Chem. Ind., Lond., 1961, No. 16, pp. 502-3, bibl. 4, illus.
Experiences in the use of fluorescent traced sprays as an advisory tool.
N.A.A.S. quart. Rev., 1961, **12**: 132-8, bibl. 4, illus.

A viewer is described which can be simply constructed. Woods' (black) glass is used to exclude visible light and permit the passage of ultraviolet light. If the spray contains a suitable tracer (e.g. Saturn yellow, Fluorescine, Fluolite C, Fluorescent Salt 3S and zinc 8-hydroxy quinolate) the deposit on leaves becomes visible when the viewer is used. Its use is independent of electricity. The second article describes field tests to determine the efficiency of spray applications.—N.A.A.S., Bristol.

Greenhouses, frames and cloches.

(*See also* 3646, 4346, 5562, 5574, 5582.)

3815. Ministry of Agriculture, London.
Construction and heating of commercial glasshouses.
Bull. Minist. Agric. Lond. **115**, revised 1960, pp. 98, illus., 6s. 0d.

The section on glasshouse construction is similar to that in the previous edition [see *H.A.*, 23: 3760], with many details brought up to date; the emphasis is placed on the construction of wooden houses, since that of metal-framed houses is best left to the specialist. The section on heating has been increased from 21 pages to 58 pages, reflecting to-day's emphasis on obtaining the maximum efficiency from such a high-priced item as fuel. There are descriptions of various types of hot-water and steam heating, and of space heating, of boiler efficiency and types, of fuels, automatic stokers and types of oil burner, of pumps and pipework and of automatic temperature control. In addition, there is a section on calculating the heat requirements of glasshouse units.

3816. Náfrádi, I.
Módszer az üvegházak fűtési költségének kiszámítására. (**A method of calculating the cost of heating glasshouses.**) [Russian and German summaries 1 p. each.]
Kisérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(4): 29-42, bibl. 10.

Tabulated data.

3817. Roer, P.
Vergelijkende dichtheidsbepalingen van kassen. (**Comparative determination of air-tightness in glasshouses.**) [English summary $\frac{3}{4}$ p.]
Meded. Dir. Tuinb., 1961, **24**: 133-6, summary 143, bibl. 6, illus.

A method is described by which the quantity of air escaping from 4 glasshouses was determined. In a Venlo type of dutch-light structure there were large gaps around the roof ventilators, and consequently the air losses from it were greater than those from 3 steel-framed glasshouses.—I.T.T., Wageningen.

3818. Rehnstrøm, F., and Christensen, H. S.
Kuldioxyd i væksthuse. **(Carbon dioxide in glasshouses.)**
Horticultura, 1960, **14**: 137-9.

The authors have calculated CO_2 absorption by new concrete in a south-facing structure of dutch lights and in a modern glasshouse. The ratio of wall surface area to volume of air was more than thirty times greater in the structure than in the glasshouse. The figures show that the new concrete in the structure could seriously compete with plant requirements for CO_2, particularly when windows and doors were closed. There was little danger of CO_2 deficiency in a newly-built modern glasshouse.

3819. Nisen, A.
Les polyesters stratifiés en construction horticole. **(Stratified polyesters in horticultural construction.)**
Bull. hort., Liège, 1961, **16**: 59-65.

From a 3-year study of the physical properties and the practical uses in horticulture of the polyester material at present available, it is concluded that this type of plastic will have its uses as a substitute for glass, especially when a quality more suitable for horticultural purposes becomes available. Two difficulties still require solution: condensation and the problem of ageing and dirtying of the material.—Inst. agron., Gembloux.

3820. Kazarian, E. A., and Downes, J. D.
Construction and operation of pneumatic plastic buildings.
Quart. Bull. Mich. agric. Exp. Stat., 1961, **43**: 594-605, bibl. 2, illus.

The construction of a pneumatic polythene building requires polythene plastic film of 4 to 10 mils thickness, which is anchored by embedding it in a perimeter trench and backfilling with soil. The soil should be watered to seal the house as well as to equalize tension on the material. Double air-lock doors are necessay to avoid pressure loss on entering or leaving the building and 2 fans are required to support a large, leak-proof structure, the second one being used for ventilation and for use when the doors are opened frequently. A half cylindrical shaped building with rectangular ends is the easiest to erect. Inflation pressures of $\frac{1}{4}$–$\frac{1}{2}$ in. of water are suitable under moderate conditions and the cost of construction is 20 cents/sq. ft. of floor area.

3821. Lekve, O.
Ökonomische Untersuchungen am mechanisierten Frühbeet "MF 56". **(Economic studies on the mechanized hotbed "MF 56".)** [English and Russian summaries 16 lines each.]
Arch. Gartenb., 1960, **8**: 475-96, bibl. 3, illus.

In a comparison of the mechanized hotbed MF 56 [see *H.A.*, 31: 193] with a conventional double hotbed over a 4-year period it was found that the costs of ventilation, sprinkling, soil heating and damping were less in MF 56, and it appears to bc very suitable for a large-scale layout, the area of which should not be less than 1,000 sq. m.—Inst. Gemüseb. Grossbeeren.

3822. Bitterman, M.
Využití poznatků o tvarech rostlin pro pěstění na krytém pozemku. **(The utilization of knowledge of plant form in the cultivation of plants on protected ground.)** [Russian and German summaries $1\frac{1}{2}$ pp. each.]
Rostlinná Výroba, 1960, **6**: 581-604, bibl. 19, illus.

Many plants in their quest for light, both in the open and under cover, adjust their shape and thereby create conditions unfavourable for the development of some organs. In experiments with kohl-rabi and tomatoes it was found that the use of large polythene barn cloches with N–S orientation, which provided adequate side as well as top light, had the following advantages over ordinary frames: ease of erection, transport and cleaning, lower cost, no shading required, reduced watering, reduced liability to infection, increased protection against cold westerly winds and quicker cropping.

TEMPERATE TREE FRUITS.

General.

(*See also* 3616, 3618, 5556, 5573, 5579, 5589, 5591.)

3823. Dragavcev, A. P.
Fruit growing in China. [Russian.]
Vestn. sel'sk. Nauki, 1961, **6**(1): 149-55, illus.

The establishment and maintenance of deciduous fruit and citrus orchards. [See also *H.A.*, 29: 1789, 1790 and 30: 3229.]

3824. Legkostup, S. S.
Reserves of fruit growing and viticulture in the Kuban. [Russian.]
Vestn. sel'sk. Nauki, 1960, **5**(12): 18-22.

Expansion and production costs are discussed, and the planting of large specialized orchards and vineyards is recommended.

3825. Kohout, K.
Rajonizace ovoce v ČSR. **(Classification of the fruit growing areas in Czechoslovakia.)** [Russian and German summaries 1½ pp. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 49-81, bibl. 20, maps.

A survey of regions and the tree fruit species and varieties grown therein.

3826. Černý, L., and others.
Vývoj a náplň práce výzkumného ústavu ovocnářského ČSAZV v Holovousích. **(The development and tasks of the Fruit Research Institute of the Czechoslovak Academy of Agricultural Sciences in Holovousy.)**
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 7-19, illus.

The Fruit-growing Institute was transferred from Průhonice to Holovousy in 1951 and became a research institute of ČSAZV in 1956. It is engaged in research and economic-management problems and comprises the following 5 sections: cultivation, physiology, pomology and genetics, plant protection, and economics and organization. The tasks of the institute are briefly outlined.

3827. Vágenknecht, J.
Návrh na soustavu strojů pro ČS. ovocnářství. **(A project for mechanizing Czechoslovak fruit growing.)** [Russian and German summaries ¾ p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 197-225, bibl. 42, illus.

An evaluation of existing machines used in fruit growing and proposals for improvements and new designs.

3828. Chiusoli, A.
Aspetti attuali e prospettive della meccanizzazione in frutticoltura. **(Present and future mechanization in fruit growing.)**
Frutticoltura, 1961, **23**: 17-30, illus.

Notes on machines for soil cultivation, fertilizer application, disease and pest control, pruning, burying prunings and harvesting in various countries.

3829. Kricnar, M.
Studium rentability intenzívně a extenzívně ošetřovaných jabloňových sadů. **(A study of the economics of intensively and extensively cultivated apple orchards.)** [Russian and German summaries 1 p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 85-100, bibl. 20.

An analysis was made of the costs of producing apples in intensively cultivated bush plantations and in both intensively and extensively cultivated plantations of standard trees. It is concluded that intensively cultivated bush plantations are the most economical, provided that sufficient skilled labour is available.

3830. Rumbeke-Beitem (Westvlaamse Proeftuin).
Jaarverslag Westvlaamse Proeftuin, Rumbeke-Beitem, 1959. **(Annual Report of the West Flanders Experimental Garden, Rumbeke-Beitem, Belgium, for 1959)**, pp. 60, illus.

The results given include those from experiments in progress on the following subjects: *Soil management:* various grass covers (and mowing frequencies), straw mulching and clean cultivation are compared for their effect on growth and production of apple trees. *Wind protection:* increases in pear yields behind wind shelter, both living and artificial screens being tested. *The use of spray materials:* comparing the effect of high and low volume spraying on apple fruit quality; a comparison of 4 materials and a combination spray for scab control. *Rootstocks:* observations on growth and fruiting of Jonathan and Cox on 20 rootstocks, including 14 Malling stocks. *Tree form:* 5 tree forms are compared for pears.

3831. Kubát, R.
Zvýšení a zjakostnění produkce ovoce ve starších sadech (demonstrační pokus). **(The increase and improvement of fruit production in older orchards (a demonstration trial).)** [Russian and German summaries ⅓ p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 263-9, bibl. 9, illus.

In a 2-ha. apple orchard comprising 15 varieties of 30- to 60-year-old trees the replacement of permanent sod by correct cover crop rotation, manuring, thinning and rejuvenation pruning and the use of a spray programme resulted in great improvements. Over a 3-year period total yields were increased by 49-67%, and top grade fruit by 112%, compared with a similar orchard not receiving the above treatments except spraying.

3832. N.S.W. Department of Agriculture, Division of Horticulture.
Early apricots—selecting, growing, marketing.
Agric. Gaz. N.S.W., 1960, **71**: 404-11, illus.

Stocks, varieties, cultivation and cover cropping, pruning, harvesting and packing, pests and diseases are discussed.

3833. Branzanti, E. C.
Due colture caratteristiche dell'Imolese: albicocco e fragolone. **(Two crops typical of the Imola district: apricot and strawberry.)**
Frutticoltura, 1960, **22**: 455-77, bibl. in text, illus.

The subjects discussed are climate, apricot and strawberry growing (often combined), spacing, manuring, irrigation, apricot training, pest and disease control, varieties.

3834. Evreinoff, V. A.
Contribution à l'étude du cognassier. **(A contribution to the study of the quince.)**
J. Agric. trop. Bot. appl., 1960, **7**: 269-98, bibl. 35.

Notes on the origin, history, climatic requirements, flowering, fruiting and varieties of *Cydonia oblonga*.

Breeding and varieties.

(*See also* 4089, 4193.)

3835. Tamássy, I.
Új gyümölcs- és szőlőfajták megtartásának (fenntartásának) néhány elvi kérdése. **(Some theoretical problems in the maintenance of new varieties of fruit trees and grapevine.)** [English and Russian summaries 1 p. each.]
Növénytermelés, 1960, **9**: 269-76, bibl. 7.

It is considered that genetical stability in new strains and hybrids can only be obtained after an intensive study of the development of the individual species. Single desirable characteristics, such as frost resistance, develop gradually and independently before fruiting occurs, and grafting or hybridization should not be carried out before these characters are stabilized. Bud sports are more prevalent when a selection is propagated before its characters are stabilized, when the scion wood is badly chosen and when the stock is too vigorous and biologically dominant.—Hort. Coll., Budapest.

3836. Nesterov, Ja. S.
Preliminary selection of fruit tree seedlings according to the length of their dormant period. [Russian, with English, German and French summaries 6 lines each.]
Vestn. sel'sk. Nauki, 1960, **5**(5): 67-72, illus.

Observations of the winter frost damage suffered by 6 *Malus* spp., 3 *Pyrus* spp. and various pear and plum varieties showed that those with the longer dormant period were less severely damaged. In apricots the length of the dormant period was related to the length of the necessary period of stratification of the seeds, the date of commencement of growth in the spring and also the type of branching of the seedling. These factors were found to be reliable criteria for selecting seedlings for winter hardiness.

3837. Nybom, N.
Some general aspects on fruit breeding.
Reprint from *Rep. 2nd Congr. Eucarpia, Cologne, 1959*, [1960], pp. 7.

A general article illustrated mainly by reference to work at the Balsgård Fruit Breeding Institute, including mention of the monofactorially inherited character of the acid content of apple, the correlation between the total acid content of the leaves and the fruit in apple and black currant, and the possible correlation between the red colour of apples and the anthocyanin content of the vegetative parts of the tree.

3838. Nybom, N., and Bergendal, P.-O.
Växtförädlingen av äpple vid Balsgård—översikt över hittills vunna resultat och erfarenheter. **(Apple breeding at Balsgård—a survey of results and experience.)** [English summary 2½ pp.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 63-92, bibl. 5, illus.

3839. Vondráček, J.
Příspěvek ke šlechtění jabloní odolných vůči strupovitosti a padlí. **(A contribution to the breeding of apples resistant to scab and mildew.)** [Russian and German summaries 1 p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 139-68, bibl. 48.

An evaluation of numerous hybrid seedlings, the oldest of which was raised in 1954.

3840. Fordyce, W.
Apples for Scotland: varieties and prospects.
Gdnrs' Chron., 1961, **149**: 50-1, illus.

Canadian and Scandinavian varieties have proved particularly successful in field trials at Mylnefield. Melba, Red Melba, Hume, Lobo, Patricia and Lawfam are Canadian varieties which yielded well, all except the last being seedlings of McIntosh Red. Cortland and Lodi (U.S.A.), Ingrid Marie (Denmark) and James Grieve, a Scottish variety, also cropped well. Exeter Cross, a new variety, is thought to be one of the most promising on trial.

3841. Johansson, E., and Sahlström, H.
Sortförsök med äpple i Norrland och Värmland. **(Apple variety trials in Norrland and Värmland.)** [English summary ¾ p.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 115-31, bibl. 3, illus.

The behaviour of several hardy apple varieties was observed in two districts of Sweden which have fairly severe winters. The trees were late in coming into bearing, and most of the varieties gave unsatisfactory results. Nearly all the varieties on *Malus prunifolia* seedling rootstocks showed some degree of incompatibility. Seedling rootstocks of a Paradise strain gave better results, suiting Cloetta in particular. Two of the new varieties, raised at Alnarp, showed promise under these conditions.

3842. Jovančević, R., and Čardaklija, Č.
Domaće sorte jabuka u Gornjem Polimlju. **(Local apple varieties in Gornje Polimlje.)** [French summary 1 p.]
Arh. poljopr. Nauke, 1960, **13**(42): 92-115, bibl. 10, illus.

Descriptions and chemical analyses of 19 local varieties, which comprise 75% of the apple population of this area in Yugoslavia.

3843. Anon.
Eleven apple varieties found suitable in Iowa.
Ia Fm Sci., 1961, **15**: 631.

In order of ripening these are Lodi, Patricia, Red Gravenstein, Minnesota 724, Lakeland, Redgold, Red Sharon, Delcon, Jonadel, Idared and A603. The last 3 are late autumn or winter apples.

3844. Tukey, H. B.
The Lodi and Fenton apples as dwarfs on the EM.IX rootstock.
Fruit Var. hort. Dig., 1960, **15**: 24.

Both varieties grow well on this rootstock.

3845. Tiscornia, J. R.
Observaciones sobre el comportamiento de variedades comerciales de manzanos y perales en el Valle de Río Negro. **(Observations on the performance of commercial apple and pear varieties in the Rio Negro valley.)**
Bol. Divulg. téc. Estac. exp. Agropec. Cinco Saltos **6**, 1960, pp. 10.

3846. Faccioli, F.
Contributo allo studio della cultivar di pero San Lazzaro precoce. **(The pear variety Early San Lazzaro.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 425-35, bibl. 4, illus.

A vigorous variety of uncertain origin, bearing early lemon-yellow fruits in clusters of 2–4.

3847. Vidéki, L., and Tápai, K.
Meggylevek festőképességének egyszerű meghatározása. **(A simple method for determining the colouring capacity of morello cherry juice.)** [English and Russian summaries ¼ p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(4): 79-84, bibl. 5.

Used in breeding for high colour.

3848. Anon.
Two new cherry varieties.
Agric. Res., Wash., 1960, **9**(5): 14.

Chinook produces large, heart-shaped to rounded cherries with mahogany coloured skin and firm dark red flesh. The fruit ripens 4–10 days earlier than Bing, and the tree is more winter-hardy. Ranier produces large, light-coloured, egg-shaped fruit that ripens 3–7 days earlier than Napoleon; the tree is extremely winter-hardy and flowers at the same time as Bing.

3849. Sites, J. W.
Plant improvement with gamma radiation.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 122-3.

Peach and trifoliate orange seeds and sour orange seedlings were irradiated with γ-rays from Co^{60} at 1,000 to 60,000 r. Peach seed germination was not affected by any of the treatments, but leaf and stem development was inversely related to the level of exposure. Results with trifoliate orange seeds were inconclusive. Seedlings of sour orange survived the initial radiation treatments with no noticeable detrimental effects, but 3 months after treatment yellowing of the leaves was observed, and dosages of 20,000 r. and over caused necrotic areas on the leaves, completely stopped growth and in some cases resulted in die-back. [See also *H.A.*, 31: 4953.]

3850. Sarti, L.
Una varietà precocissima di pesca. **(A very early peach variety.)**
Frutticoltura, 1961, **23**: 66-7, illus.

Madeleine Pouyet, from a bud mutation of Mayflower, is disease-resistant and highly productive.

3851. Aliev, G. G., and Gadžiev, T. Ju.
Peach varieties resistant to leaf curl. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 30-3, illus.

The tree and fruit of 5 varieties grown in the Azerbajdžan are described.

3852. Overcash, J. P.
Peach varieties for Mississippi.
Bull. Miss. agric. Exp. Stat. **586**, 1959, pp. 8, illus.

3853. Bradt, O. A.
The Royalvee peach.
Fruit Var. hort. Dig., 1960, **14**: 50.

Released by the Vineland Experiment Station, Ontario, this variety resulted from a cross between Halehaven × Vedette and Veteran. The fruit is of medium size and bright red, and the flesh is bright yellow, fairly firm and of good flavour. It is a semi-freestone type. The trees are not large but very productive and require heavy thinning.

3854. POPENOE, J.
Plum variety trials in Alabama.
Fruit Var. hort. Dig., 1960, **14**: 49-50.

In trials started in 1955-56 the best crops were produced by Bruce, Brilliant, Endicott, Methley, Munson, Ozark Premier, Red Coat, Red June, Red Roy, Sapa and Toka. Of these Ozark Premier appears the most promising.

3855. ZIELINSKI, Q. B., AND SISTRUNK, W. A.
Quality evaluation of fresh, canned and dried plum varieties in Oregon.
Fruit Var. hort. Dig., 1960, **15**: 22-3.

Data on the better varieties are tabulated. Among the outstanding prune varieties were Parson, Stanley, Merton, Milton Early Italian and Moyer Perfecto.

Propagation and rootstocks.

(*See also* 3621, 3628, 3635, 3830, 3841, 3844, 3900, 3916, 3921, 3933, 4193, 4326, 5573.)

3856. SOUČEK, J.
Registrace vybraných planých a kulturních ovocných odrůd k pěstování podnožového materiálu. (**The registration of selected wild and cultivated fruit varieties for rootstock production.**) [Russian and German summaries ½ p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 229-39, bibl. 26.

In Czechoslovakia 6,271 pome- and 13,443 stone-fruit trees are registered, the fruit of which is purchased, the seed extracted and released to rootstock nurseries.

3857. BOLOTSKIJ, JU. S.
Methods of preparation of seeds of cultivated fruit plants for sowing. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 37-9.

A method of treating seeds of apple, pear, cherry, plum, apricot, grape and bean, by enclosing them in small bags and immersing these in iced water, was compared with stratification in sand. Apart from 1 experiment with Siberian apple seeds which would not germinate even after 75 days of this treatment, better germination and more vigorous seedling growth usually occurred after cold water treatment than after normal stratification.

3858. KOTENKO, E. T.
Raising fruit tree transplants in one year. [Russian.]
Sadovodstvo, 1960, No. 11, pp. 22-4.

The methods employed on a collective farm are described. Seeds of cultivated apple, wild pear and some stone fruits were sown, after stratification, in the field in spring, the ground being heavily manured and fertilized. With watering and further top dressings of fertilizer, the seedlings were large enough to be budded in their first year.

3859. PALOCSAY, R.
Înmulțirea pe rădăcini proprii a materialului pomicol în stadiul tînăr de dezvoltare. (**Propagation of young fruit planting material on its own roots.**) [English, Russian, French and German summaries 1 p. each.]
Grăd. Via Liv., 1960, **9**(7): 27-30 + summaries, illus.

A method is described for the rapid production of clonal material from hybrid fruit tree seedlings. When the seedlings are at the 4–5-leaf stage the roots are pinched back at 6–7 cm. and the plants are kept in pots under glass, shaded and watered for a period of 2 weeks. The seedlings are transplanted at the end of May and the roots uncovered 1–2 cm. at a time to a final depth of 10–15 cm. In mid-October the roots which have developed buds are covered with earth, and at the end of March or beginning of April the aerial portion of the plant is cut down by $\frac{1}{2}$–$\frac{2}{3}$. When there is no further danger of frost, the upper 4–5 cm. of the lateral roots are again uncovered and severed from the main root; the adventitious buds then develop into shoots.

3860. MAZZINI, C.
Il tumore d'innesto. (**Graft tumours.**)
Frutticoltura, 1961, **23**: 31-4, illus.

Graft tumours, apparently not pathological in origin, developed commonly under the following conditions: when hot pitch had been applied to the union at the time of grafting; when the union was too near the root region of the stock; when all the new shoots were removed simultaneously from the rootstock after grafting; when the scion was woody and the graft triangular [wedge graft?]; and when the rootstock was resuming, or about to resume, growth at the time of grafting. The malformation was more frequent when quince was used as a rootstock [presumably for pears] than when seedlings were used.

3861. TUROVCEV, N. I.
Concerning the propagation of apples and pears by stem cuttings. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 36-7.

Shoots from adventitious buds derived from secondary meristems were found to root more readily than shoots from lateral or axillary buds derived from the primary meristem.

3862. TUROVCEV, N. I.
Qualitative differences in buds from different parts of the tree crown. [Russian.]
Sadovodstvo, 1960, No. 7, pp. 28-30.

Better growth was obtained, in the first year after budding, from apple buds taken from the central and upper parts of the shoots in the lower and central tiers of the crown of the mother tree. Buds from the central and upper parts of shoots formed a union more quickly with the rootstock and began differentiating leaves sooner in the following spring, and the shoot from the bud had a longer growing period. One-year-old plants from buds on the lower tiers of the crown were found to have a higher percentage of dry matter, less intensive transpiration and photosynthesis, a lower content of soluble carbohydrates and a lower level of activity of the peroxidases and polyphenoloxidases.

3863. Garner, R. J., and Hatcher, E. S. J.
Delayed flowering of trees raised from adventitious scions.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 52-3, bibl. 5.

One-year-old shoots of the apple rootstock Crab C arising adventitiously from sphaeroblasts and from normal buds were grafted on the dwarfing rootstocks M.VIII and M.IX. After 5 years' growth the trees of sphaeroblast origin were producing fewer flower trusses, and proportionally many more vegetative terminal buds, than the trees raised from normal shoots. In a second trial with Crab C on M.IX trees derived from scions which had been taken from hedges or shoot cuttings produced, in their 4th year, many more flower trusses and fruits than comparable trees derived from scions taken from sphaeroblasts or root cuttings.

3864. Grjazev, V. A.
The influence of temperature and moisture on the establishment of buds. [Russian.]
Sadovodstvo, 1960, No. 7, pp. 30-1.

Apple seedlings were budded on 2 dates in August when the temperature and relative humidity were very different. Good results were obtained when budding was done at 24·6° C. and 43% R.H., 80% of the buds producing satisfactory trees. Only 49% were satisfactory when the budding was done at 18° C. with 100% R.H.

3865. Mosse, B., and Labern, M. V.
The structure and development of vascular nodules in apple bud-unions.
Ann. Bot., Lond., 1960, **24**: 500-7, bibl. 12, illus.

An account is given of the development of new meristematic centres (vascular nodules) initiated in callus tissue formed in apple stems as a result of budding. Both amphivasal (xylem peripheral) and amphicribral (phloem peripheral) nodules occurred, and attention is drawn to the relationship between the type of nodule formed and the tissue in which it originated. The similarity of these structures to the meristematic nodules arising in tissue cultures is discussed, and their possible practical significance as an aid in the rooting of cuttings is pointed out. [Authors' abstract.]—E. Malling Res. Stat., Kent.

3866. Smith, N. G., and Rogers, W. S.
Higher budding of apple rootstocks.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 49-51, bibl. 6.

In two experiments budding Cox's Orange Pippin at 9 or 12 in. above ground level gave an equally good "take" of buds as budding at 6 in., and resulted in taller maiden trees. Budding varieties susceptible to collar rot (such as Cox's Orange Pippin) on to resistant rootstocks at 12 in. is likely to ensure avoidance of this disease, and will also entirely eliminate scion rooting. Budding apples, particularly those susceptible to collar rot, at 12 in. above ground level is therefore recommended as a nursery practice. [Authors' summary.]

3867. Atkinson, J. D., and Mouat, H. M.
Height of working Cox's Orange apple trees in New Zealand.
Orchard. N.Z., 1960, **33**: 350-3, bibl. 6.

Evidence suggests that Cox should be worked higher than is usual for apples, to avoid infection by *Phytophthora cactorum*. The recommended height for New Zealand conditions is about 20 in. above soil level.—D.S.I.R., Auckland.

3868. Gavrilović, M., and Mišić, P. D.
Ispitivanje deblotvoraca za jabuku. **(Investigations on stem builders for apples.)** [English summary 1 p.]
Arh. poljopr. Nauke, 1960, **13**(40): 54-61, bibl. 14.

The frost resistance of the cambium, leaf buds and bark and the regeneration of injured tissues were studied in 16 varieties. Seedlings of *Malus sylvestris* were the most satisfactory and Delicious was the most sensitive to frost injury. None of the other varieties was really satisfactory, and the indigenous *M. sylvestris* is recommended as both rootstock and stem builder.—Inst. Fruit Growing, Čačak.

3869. de la Rocha G., G.
Ensayo del sobreinjerto en manzano. **(An experiment on double working of apple trees.)**
Inf. mens., La Molina, 1960, **34**(398): 14-18.

The apple variety Winter Banana grafted on quince usually manifests incompatibility after the second year. Of the 4 interstocks tested, the San Antonio apple and Pero-Manzano pear gave the best results. Simultaneous grafting of the 3 sections was successful and saved a year in the nursery, but the lapse of a year between grafting the interstock and grafting the scion gave more vigorous plants.

3870. Tomaselli, R., and Refatti, E.
Sull'inesistenza di relazioni costanti tra anatomia radicale e vigoria in meli e peri innestati. **(The non-existence of constant relationships between vigour and root anatomy in grafted apple and pear trees.)** [English summary 8 lines.]
Atti Ist. bot. Univ. Pavia, Ser. 5, 1960, **18**: 130-40, bibl. 5.

The vigour of Stark Delicious apple and Emperor Alexander pear trees bore no relation to the anatomical characteristics of the roots of the stocks on which they were grafted.

3871. Zeiger, D., and Tukey, H. B.
A historical review of the Malling apple rootstocks in America.
Circ. Bull. Mich. agric. Exp. Stat. **226**, 1960, pp. 74, bibl. 187.

Investigations on propagation, compatibility, hardiness, tree size, interstocks, root systems, precocity of fruiting and fruit quality.

3872. Sullivan, D. T.
Dwarf apple rootstocks.
Fruit Var. hort. Dig., 1960, **14**: 51-2, illus.

Results of a 1955 planting of dwarf apple trees made by the New Mexico State University show that generally the growth of trees of the same variety on M.VII has been very uniform and all are well anchored. On M.VII the Franklin and Melrose varieties have produced trees almost as large as the same varieties on seedling rootstocks; Richared is very vigorous, whereas Golden Delicious and Lodi are somewhat dwarfed. The varieties on M.IX are not uniform and there is evidence that many have scion rooted. Franklin on M.IX is slightly larger than on M.VII and is well anchored. Golden Delicious is slightly smaller than on M.VII. Richared on M.IX leaned badly and broke after 3 years. Jonared, Williams Early Red, Stayman Winesap and Cortland, all on M.IX, have made variable growth but are well anchored. Varieties on Clark interstock with Virginia Crab rootstocks have lacked vigour.

3873. Bosschaart, P. A., and van der Meer, K.
Enkele ervaringen met M.IV op rivierkleigronden. **(Some observations on M.IV growing on river clay.)**
Fruitteelt, 1961, **51**: 247.

Comparisons of yields and fruit quality with trees on M.II and M.I.

3874. Tudosescu, O.
Soiurile locale de măr-portaltoi de perspectivă. **(Local apple varieties potentially valuable as rootstocks.)** [English, French, German and Russian summaries ¾ p. each.]
Grăd. Via Liv., 1960, **9**(10): 44-5 + summaries.

Jonathan grafted on wild apple rootstock only produced satisfactory fruit in the first year. Of a number of local Romanian varieties tested, Cretzesc and Salciu proved to be satisfactory as rootstocks for a number of varieties including Jonathan, and in the nursery they readily provided large numbers of good quality seedlings for this purpose.

3875. Kuznecov, M. D.
A method of raising rootstocks of wild forest pear in nutrient blocks. [Russian, with English summary 6 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 3, pp. 137-51, illus.

When rootstocks of wild pear were raised from seed in nutrient blocks, they developed a strong, fibrous root system. For general use the blocks should be 5 × 5 × 5 cm. but their size does not greatly affect the seedling growth. The seeds will germinate satisfactorily in soil of pH 6·4–6·7, but the seedlings grow better at pH 4·0–6·0. The seeds germinate best (up to 84·5%) without fertilizers, but for subsequent growth of the seedlings a supply of NPK is required.

3876. Garner, R. J., and Nicoll, C. P.
The compatibility and growth of pear scions on apple rootstocks.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 54-6, bibl. 3, illus.

Eighteen clonal apple rootstocks were budded with three pear varieties [Fertility, Hardy and Williams']. All combinations were incompatible in varying degree. The rootstock M.XVI was distinctly more compatible than the others, and the pear variety Fertility was comparatively tolerant of apple rootstocks. The degree of sphaeroblast production on the rootstocks was correlated with increased incompatibility. [Authors' summary.] Brief reference is also made in this paper to another experiment in which *Sorbus aria* was grafted on 4 apple rootstocks, of which M.XVI alone showed anything more than fleeting compatibility.

3877. Oldén, E. J.
Orienterande plantskole- och grundstamförsök med några dvärgunderlag för päron. **(Preliminary nursery and rootstock studies with some dwarfing pear stocks.)** [English summary 1¼ pp.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 103-14, bibl. 10, illus.

In trials with several pear varieties most of those worked on *Aronia melanocarpa* and *Crataegus monogyna* were discarded after the nursery trial because of incompatibility. Varieties on *Amelanchier canadensis*, when compared in an orchard trial with those on quince, fruited earlier but had rather poorer anchorage. Incompatibility on *Amelanchier* showed a similar range to that on quince, and it is suggested that more generally compatible *Amelanchier* stocks could be obtained by breeding and selection.

3878. Buchloh, G.
The lignification in stock-scion junctions and its relation to compatibility.
Reprint from *Phenolics in plants in health and disease*, Pergamon Press, Oxford, etc., 1960, pp. 67-71, bibl. 4, illus.

The distribution of lignin in differentiated cell walls of compatible and incompatible pear-quince grafts and in ungrafted pear shoots was examined by microspectroscopy and the electron microscope. From the results of observations and histochemical tests it was concluded that the processes which are involved in the lignification of the cell walls are mainly responsible for the formation of strong unions in grafted pear-quince trees. Reactions which inhibit the formation of lignin and the establishment of a mutual middle lamella between the component parts give rise to the formation of weak unions.

3879. Nichols, C. W., and others.
Pear decline in California.
Bull. Calif. Dep. Agric., 1960, **49**: 186-92, bibl. 31, illus.

Symptoms are described with coloured illustrations, and the literature on the subject is reviewed. The situation in California is surveyed; recent observations have shown that Bartlett trees which had developed roots above the graft union have not exhibited decline symptoms.

3880. (Batjer, L. P., and Schneider, H.)
Death of food passages linked to pear decline.
Agric. Res., Wash., 1960, **9**(4): 14, illus.

Pear trees on Oriental rootstocks are highly susceptible to decline, which is caused by a substance toxic to the rootstock sieve tubes but not to scion sieve tubes, and which moves across the bud union causing the death of some sieve tubes and a thickening of the walls of the rest. Trees on French seedlings are moderately resistant and those on Bartlett seedlings are rarely affected.—Wash. agric. Exp. Stats and Calif. agric Exp. Stat.

3881. Tamási, J.
A comparative examination of the root systems of apricots grafted on wild apricot (*Prunus armeniaca* L.) and on myrobalan (*Prunus myrobalana* Loisel) growing on shifting sand. [Russian, with French and German summaries 1 p. each.]
Acta agron. hung., 1960, **10**: 147-67, bibl. 23, illus.

The author disagrees with statements by other authors that there is necessarily any fixed relationship between the size and form of the root system and that of the top of a tree. In support of his arguments the results of many excavations of root systems are presented. The ratio of the density of the larger roots inside the canopy to that outside the canopy was found to be 5·9 : 1 for apricots grafted on wild apricot rootstocks and 5·8 : 1 for trees grafted on myrobalan. For fine roots the ratio was 7·5 : 1 on wild apricot and 4·4 : 1 on myrobalan. [See also *H.A.*, 30: 1663.]

3882. Tarasenko, M. T., and Štefan, N. N.
Rooting softwood cuttings of cherry and plum in relation to the growth phases and development of the shoots. [Russian, with English summary 3 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 3, pp. 123-36, bibl. 14, illus.

The rooting of softwood cuttings was found to be most intensive in the early stages of shoot growth when extension of growth was most rapid. The optimum period for taking cuttings varied with the variety, free-rooting varieties having a longer rooting period than shy-rooting ones. The period during which cuttings could be taken was longer for most of the plum varieties tested than for the cherry varieties. In the Moscow district the best time for taking softwood cuttings of both cherry and plum was found to be during the first 3 weeks of June.

3883. Oratovskij, M. T.
Some results of grafting young seedling cherries in the crowns of sour cherry trees. [Russian.]
Agrobiologija, 1960, No. 4, pp. 618-19.

Seedlings grafted into the crown of a mature tree fruited 3–4 years earlier than seedlings on their own roots. The top part of the shoot of a 50-day-old seedling was grafted onto a 2-year-old branch on the periphery of the mature tree; these grafts fruited 3 years later.

3884. Uvarov, F. Z.
Mahaleb cherry as rootstock for cultivated varieties in the Kujbyšev region. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 105-6.

Mahaleb seedlings grew to 50–80 cm. in their first year and made suitable rootstocks for the 3 varieties of cherry tested. Budding was more successful if carried out on 30 July than on 21 July. The root systems of the mahaleb seedlings were deep, well branched and consequently drought resistant.

3885. Kirkpatrick, J. D.
A study of *Prunus cerasus* var. Montmorency in Western New York: interrelations of rootstock, soil composition, root and soil populations of stylet-bearing nematodes, leaf composition, fruit quality, yield, and tree vigor.
Diss. Abstr., 1960, **21**: 288-9, being *L.C. Card No. Mic.* 60-2493 of 1,393 pp.

The rootstock on which Montmorency sour cherry is propagated greatly influences the relationships between, and among, the following factors: the available nutrients in the soil, soil pH, base exchange capacity and soil organic matter; populations of stylet-bearing nematodes in roots and the soil; internal fruit quality; fruit size and yield; and leaf size. The relationship of leaf curl (a symptom of K deficiency) to the leaf-K content and level of available K in the soil indicates that on *Prunus mahaleb* less K is absorbed than on *P. avium*. By using leaf composition in combination with partial regression statistics as a criterion of tree nutritional status, relationships between fruit yield and size, tree vigour and population levels of stylet-bearing nematodes which were predicted agreed closely with those obtained using the levels of soil applications of N, P, K and an experimental nematicide as the criterion of tree nutritional status. High tree vigour depended upon the local rates of soil applications of K and/or N in combination with soil applications of P and the nematicide. Nematode populations were strongly influenced by the nutritional status of the tree. The virus status of the tree affected leaf composition as well as tree vigour. Potassium sulphate and potassium chloride were comparable as sources of K, when no P was applied, in their effect on yield, fruit size, tree vigour and leaf size. [See also *H.A.*, 30: 5160 and 5161.]—Cornell Univ.

3886. Friedrich, G.
Einfluss verschiedener Unterlagen auf Wuchs und Ertrag von Schattenmorellen. (**The influence of various rootstocks on the growth and yield of sour cherries.**)
Züchter, 1960, **30**: 330-40, bibl. 12, illus.

With both *Prunus avium* and *P. mahaleb* some genotypes gave rootstocks which encouraged high yield and good growth, whereas others were quite unsuitable. With mahaleb individual fruit weight was consistently higher than with *P. avium*. The mahaleb variety Heimann 10 is recommended for light soils and the *P. avium* variety Hüttnerschen for heavier soils.—Inst. Obst- u. Gemüseb. Martin-Luther-Univ. Halle-Wittenberg.

3887. Mosse, B.
Further observations on the effects of ring-grafting peaches with an incompatible rootstock variety.
J. hort. Sci., 1960, **35**: 275-81, bibl. 8, illus.

Evidence is presented that factors causing incompatibility between the peach variety Hale's Early and the rootstock Myrobalan B can be translocated in ring-grafted trees across a four-inch intermediate stem piece of the mutually compatible rootstock Brompton. The variety Hale's Early proved to be more sensitive to incompatibility than Myrobalan B and was more severely affected both in its growth when used as a scion and in its anatomical structure when used as a ring-graft. Tnraslocation of factors causing anatomical abnormalities was confined to downwards movement, but effects on growth and cropping were transmitted to the scion. It is considered improbable that effects on growth were entirely the result of impeded translocation across the ring-grafts, but the question remains open whether this type of incompatibility may be caused by virus infection. [From author's summary.]—E. Malling Res. Stat., Kent.

3888. Mosse, B.
Graft incompatibility in plums; observations on a ten-year-old field trial.
J. hort. Sci., 1960, **35**: 260-5, bibl. 9.

There was a good correlation between union structure of 2- and 10-year-old trees, but breakages occurred in one combination at 10 years which had shown little sign of incompatibility when 2 years old. Union structure showed a general tendency to improve as the trees became older, and of 107 unions classified as incompatible when 2 years old only 15 broke. A high proportion of the breakages occurred in incompatible unions where the variety Victoria was one of the graft components. The theory is advanced that in older trees the ultimate strength of an incompatible union is related, in addition to the cross-sectional area of vascular connection established, to the varietal characteristics of wood structure. Incompatibility between different plum varieties was found to be prevalent. [From author's summary.]—E. Malling Res. Stat., Kent.

3889. Mosse, B.
Graft incompatibility in plums: interactions between the varieties Victoria, President, and Myrobalan B.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 57-60, bibl. 9, illus.

Small-scale trials are described in which interactions between the plum varieties Victoria and President and the rootstock Myrobalan B were investigated. Trees were constructed containing these three graft components in different relative positions, with the following results: (1) The varieties Victoria and President were not fully compatible. (2) Trees containing Victoria, President and Myrobalan B tissue in vertical sequence developed a strong incompatibility reaction between President and Myrobalan B when these were adjacent, irrespective of their relative amounts and positions in the tree. In two trees where buds of Victoria and President were inserted on opposite sides of the rootstock stem, however, no incompatibility symptoms developed. (3) The incompatible condition was not transmissible by buds of the variety President from an incompatible tree. [Author's summary.]

3890. Souček, J., and Burget, J.
Výsledky dalších pokusů s podnožemi pro slivoně. **(Results of further trials with plum rootstocks.)** [Russian and German summaries $\frac{1}{3}$ p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 243-60, bibl. 24, illus.

The original plum rootstock trials at Průhonice [see *H.A.*, 20: 72] were continued after 1952 at Holovousy. Three prune, 1 plum and 2 gage varieties were budded on St. Julien de Toulouse, Durancia (oval, blue-violet, sweet clingstone plums), EM Damas C (Black Damascena C), Červená slivka (the Hungarian Vörös szilva) and Wagenheim prune. Bud take, growth, frost resistance and cropping were evaluated, and the vegetatively propagated St. Julien was found the most satisfactory in all respects. The Durancia seedlings came second, but are recommended only for nurseries where the percentage of take is high. Seedlings of Damas C were also satisfactory, but the other 2 rootstocks were unsuitable.

3891. Arhipov, V. S.
Cherry plum (*Prunus cerasifera*) as a rootstock for plums in the central region of the R.S.F.S.R. [Russian.]
Agrobiologija, 1960, No. 3, pp. 464-5.

Four plum varieties were more vigorous on this rootstock than on bullace (*P. insititia*) and the root systems were equally resistant to low temperature.

3892. Tarasenko, M. P.
Apricot—a plum rootstock in the Ukrainian S.S.R. [Russian.]
Sadovodstvo, 1960, No. 7, pp. 23-5, illus.

In the south of the Ukraine plums on apricot seedling stocks are long lived and give high yields. Some plum varieties are incompatible. The apricot seeds germinate readily and produce stocks which may be grafted in the first season and which do not produce suckers.

Climatic factors.

(*See also* 3830, 3836, 3868, 3919, 3922, 3924, 3948, 3961, 3986, 4226.)

3893. Šaryj, N. Ja.
The development of horticulture on virgin lands. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 25-7, illus.

The successful establishment of apples, plums and gooseberries under the extreme climatic conditions of the Pavlodar region is described.

3894. Šilov, M. S.
The cause of losses of fruit trees in the Kirgizia. [Russian.]
Sadovodstvo, 1960, No. 12, pp. 24-6.

A discussion of the effects of winter temperatures.

3895. Matjunin, N. F.
The question of frost resistance in fruit growing. [Russian.]
Sadovodstvo, 1960, No. 11, pp. 31-3.

The damage suffered by apples, pears, cherries, plums, peaches and apricots in the severe winter of 1954 in Uzbekistan is summarized, and the varieties studied are rated for frost resistance. Hybrid varieties were, in general, more resistant, and pruned trees suffered less damage than unpruned trees.

3896. Rogers, W. S., and Modlibowska, I.
Practical frost protection of fruit by water sprinkling.
Grower, 1961, **55**: 658-61, illus.

Practical advice on irrigation equipment and its use for frost protection on tree fruits and black currants.

3897. WECA.
Schade door beregenen op pruimen. **(Damage to plums by sprinkler irrigation.)**
Fruitteelt, 1961, **51**: 403, illus.

After a night of sprinkler irrigation for frost protection, many plum branches were split by the weight of ice and some trees were irreparably damaged. The rotary rainers with 5 mm. nozzles were spaced at 24 × 24 m., and pressures of between 3½ and 4½ atm. were used. It is recommended that for sprinkling plums pressures of no higher than 3 atm. should be used, and nozzles should not be smaller than 5 mm. (at 24 × 24 m.).

3898. Wirth, A.
Gedanken zur Spätfrostbekämpfung im Obstbau. **(Thoughts on protection against late frosts in fruit-growing.)**
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 193-200, illus.

Direct methods discussed are the use of smoke and air inversion (both used only against radiation frosts and giving temperature rises of 1–2° C.) and heating with oil burners and sprinkling (which give temperature rises of 6–8° C.). Indirect methods of protection include choice of situation, of fruit species and of variety. For example, Schweizer Orange Apfel is very frost hardy, Glockenapfel and Golden Delicious less so, and Belle of Boskoop is most susceptible. Delaying flowering by cultural practices which favour the appearance of flowers on 1-year-old wood, and the influence of dwarf forms of tree on frost hardiness are also mentioned. Costings are discussed, and a table comparing the cost of heating with different types of oil and burners, and of sprinkling, is given.—Eidg. Versuchsanst., Wädenswil.

3899. Hristo, A. A.
The dormant period and winter hardiness of apple trees under conditions of western Siberia. [Russian, with English summary $\frac{1}{3}$ p.]
Fiziol. Rast., 1961, **8**: 58-66, bibl. 31.

Apples grown in the Novosibirsk territory comprise 4 groups. The hardiest are the Siberian berry apples (*Malus pallasiana*) used as rootstocks or as ornamentals. These are followed by the related reinettes, the fruit of which is very small and suitable for processing only, and then by semi-cultivated varieties originating from Kitajka (*M. prunifolia*) or reinettes crossed with European varieties. Least hardy of all are the Central Russian and Mičurin varieties, all of which are grown in prostrate form. *M. pallasiana* and the reinettes were found to require a much shorter dormant period than the Central Russian or Mičurin varieties. In all apples vegetative buds broke successively, the terminal bud being the first. In the hardier forms starch hydrolysis was more rapid and fat accumulation greater. With increasing frost resistance the swelling of the protoplasmic colloids in the cells of the cortical parenchyma decreased. Separation of the protoplasm in these cells occurred in all the species and varieties, but was most pronounced in the hardiest species.

3900. Čižov, S. T.
Winter hardiness in the hybrid seedlings of Lukašov pears. [Russian, with English summary 7 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 5, pp. 202-5, bibl. 4.

This group of pears is winter hardy, but the fruit has a tart flavour and is unsuitable for fresh consumption. Seedlings from open pollination were more hardy than those from crosses made with cultivated varieties. Lukašov pears are recommended as frost resistant rootstocks.

3901. Tukey, R. B.
Bud hardiness of peach varieties in Indiana.
Fruit Var. hort. Dig., 1960, **15**: 2.

Observations on 26 varieties of peach suggest that —10° F. is close to the minimum for bud survival in most varieties.

3902. Walker, D. R., and Donoho, C. W., Jr.
Winter injury in peaches.
Res. and Fmg, N.C., 1960, **18**(3): 4, illus.

After the leaves had fallen 2-year-old Elberta peach trees were kept in controlled temperature rooms at 40° F. and 65° F. At different times during the winter they were transferred to a chamber where the temperature was lowered at the rate of 3° F. per hour to 0, 7, 14 or 21° F., the roots being protected with insulated covers. The trees were then allowed to warm up for 5 hours. Cell injury was measured electrically, using water solutions in which the terminal twigs had been left for 24 hours. All the trees held at 40° F. showed the same cold resistance at all subsequent temperatures, whereas those stored at 65° F. showed much more injury which increased with decrease in temperature. Cold resistance decreased later in the season. Trees stored at 65° F. and then transferred to the temperature room at 40° F. for 7 days before freezing developed more cold resistance than those hardened for only 1 day at 40° F., whereas resistance decreased in trees transferred from 40° F. to 65° F. for 7 days before freezing; the resistance of the latter, however, was still higher than that of trees held continuously at 65° F.

3903. Alma, A.
Ureumbespuitingen tegen nachtvorst. **(Urea sprays against night frost.)**
Fruitteelt, 1961, **51**: 111.

Flowers of peaches, plums, strawberries and currants were protected from spring frost injury by a single spray of urea applied at the start of flowering. A concentration of 0·2–0·3% is recommended, and the spray must be applied at least 24 hours before a frost occurs.—Cistercian Abbey, Diepenveen.

3904. Mowry, J. B.
Climatic conditions and attractiveness of apple varieties.
Fruit Var. hort. Dig., 1960, **14**: 53-7, bibl. 17, and **15**: 33-7, bibl. 6.

Apple variety samples representing 8 geographic locations in the U.S.A. were visually and photographically evaluated for fruit characteristics affecting attractiveness. Geographic and climatic conditions influencing attractiveness were summarized for each location and compared by correlation analysis. The agreement between the location ranks for attractiveness was not statistically significant. For this group of locations high latitude was closely associated with low average precipitation throughout the growing season Average absolute humidity varied directly with average precipitation in July. High latitude was also associated with less prominent dots (lenticels) on apple fruits at harvest, and high elevation was associated with greater attractiveness and fewer dots. Throughout the growing season precipitation (with associated absolute humidity and sunlight intensity) had a greater effect than average temperature on characteristics affecting attractiveness of fruits at harvest, and the percentage of possible summer sunshine was not associated with characteristics affecting attractiveness. Low average absolute humidity in July was associated with greater attractiveness, a greater amount of red colour and less prominent dots on the fruits. Low average precipitation (indicating low average absolute humidity and high light intensity) and low average temperature during the summer months were associated with less prominent dots. High precipitation during the 4 weeks after bloom was associated with a high intensity of red colour, indirectly emphasizing the importance of favourable growing conditions for the accumulation of carbohydrates in fruits. [From author's summary. See also *H.A.*, 31: 1935.]—Ill. hort. Exp. Stat., Carbondale.

3905. ANON.
Injury may be reduced.
Agric. Res., Wash., 1960, **9**(2): 15.

Splitting of sweet cherries may be reduced by reducing water absorption, increasing transpiration rate, decreasing the rate of expansion of the fruit cells and increasing skin strength. Possible practical measures include the use of aircraft to create air movement, the use of orchard heaters to increase transpiration and the use of chemical sprays to increase skin strength.

3906. CRESCIMANNO, F. G.
La cascola delle gemme di pesco in relazione al fabbisogno di freddo. **(Bud drop of peaches in relation to chilling requirement.)**
Inf. fitopat., 1961, **11**: 44-5.

Peach varieties such as Mayflower and Early Rose, which are known to have a chilling requirement of about 1,150 hours below 7° C., are unsuitable for the climate of Sicily, where they shed 60–90% of their flower buds. The variety Amsden behaves similarly, but J. H. Hale and Morettini No. 1 are much better adapted to mild winters [see also *H.A.*, 31: 1940]. Breeders hope to combine early ripening (for avoidance of Mediterranean fruit fly) with a low chilling requirement. The development of Morettini No. 1 from Mayflower × Superba appears to be a successful step in this direction.

Soil management and irrigation.

(*See also* 3644, 3649, 3742, 3805, 3828, 3830, 3930, 4220, 4225, 4368.)

3907. LARSEN, R. P., AND RIES, S. K.
Simazine for controlling weeds in fruit tree and grape plantings.
Weeds, 1960, **8**: 671-7, bibl. 9.

Simazine at 8 lb./acre gave good to very good control of annual weeds and grasses under apple, pear, sour cherry and peach trees of various ages and under 4-year-old vines, without causing injury. The treatment improved the growth of young apple and peach trees and in one location the yield of vines.—Mich. agric. Exp. Stat., E. Lansing.

3908. STOVELL, F. R.
Control of weeds in fruit.
Essex Fmrs' J., 1961, **39**(11): 33, 35-6.

MCPA (1–2 lb./acre) will control docks, nettles and creeping buttercups in apple and pear orchards without causing tree damage. Couch and other grasses may be controlled by dalapon (6 lb./acre) applied in spring or autumn or by amino triazole (4–6 lb./acre) applied before fruit set or after picking. Simazine (1–2 lb./acre) may be used to maintain a clear area around the collar of the tree and should be applied before February. Bindweed and creeping buttercup in black currants may be controlled by a September spray of MCPB (2 lb./acre) when the bushes are dormant. Simazine (2 lb./acre) applied annually will control annual weeds and should be applied to black currant plantations in February–March after cultivation.

3909. HOLLOWAY, R. I. C.
A progress report of trials of simazine and monuron on some fruit plants.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5, bibl. 12.

Simazine at 2·5 and 5 lb./acre and monuron at 5 and 10 lb./acre were applied for 2 seasons in raspberries and black currants and for one season in apples and pears. Simazine had no adverse effect on any of the crops, whereas monuron injured all except apples.—E. Malling Res. Stat. —From *Weed Abstr.*, **10**, No. 78.

3910. LEEFE, J. S.
Vegetation control around young apple trees.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, p. 44.

Herbicides were applied annually at blossoming for 4 years to 2-year-old Secor trees on M.I. Hoeing was done 4 times per season. Amitrole at 5 and 10 lb./acre gave fair control of couch (*Agropyron repens*) and almost complete control of other vegetation, and resulted in better apple growth than mechanical hoeing but not as good as that given by hand hoeing. Dalapon at 7·4 and 14·8 lb./acre ± 2,4-D at 1 lb./acre failed to control broadleaved weeds and significantly reduced apple growth compared with both mechanical and hand hoeing. The hand-hoed apple trees made significantly better growth than those mechanically hoed.—Kentville Res. Stat., N. S.—From *Weed Abstr.*, **9**, No. 1943.

3911. HEWETSON, F. N.
Chemical weed control in the peach nursery.
Progr. Rep. Pa agric. Exp. Stat. **223**, 1960, pp. 2, illus.

Effective weed control was obtained with a pre-emergence application of 4 lb. 2,4-DES plus 2 lb. CIPC in 66 gal./acre from a specially designed sprayer mounted on a nursery-type tractor. No adverse effects on tree stand were observed.

3912. (CLARKSON, V. A.)
L'emploi de paillis en film de polyéthylène accélère la croissance des arbres. **(The use of a polythene mulch increases the rate of tree growth.)**
L'Agric. pratique, Paris, reprinted in *Courr. hort.*, 1961, **23**(1): 37, illus.

Trunk diameters of 3 apple varieties increased by 55–100% and those of 3 ornamental trees by 45–571% as result of plastic mulching.

3913. BASKETT, W. J.
Polythene plastic sheeting for mulching fruit trees and vegetables.
J. Agric. S. Aust., 1960, **64**: 149.
In New South Wales black polythene sheeting used for mulching young fruit trees reduced the need for watering by one-third. At a minimum rate of 1 sq. yd of 1/1,000 in. thickness per tree, the cost was £5 per acre plus labour costs. The sheeting may also be used for mulching winter tomato crops to obtain cleaner fruit and higher soil temperatures and to reduce irrigation needs, weed growth, root damage and the spread of soil-borne disease.

3914. PROEBSTING, E. L.
Problemi delle colture consociate nei frutteti. **(Problems of cover cropping in orchards.)**
Inf. Ortofruttic., 1960, **1**: 163-5, illus.
Experiences in California are discussed, as being possibly applicable to Italy.

3915. JENNINGS, J. P.
Sod culture for fruit trees on sandhills.
J. Agric. S. Aust., 1960, **64**: 201, 203.
Advantages and disadvantages outlined.

3916. ČŽAN ČŽI-JUN.
The distribution of plum roots in relation to the depth of soil cultivation. [Russian.]
Sadovodstvo, 1960, No. 11, pp. 26-8.
The distribution of the roots of the plum variety Skorospelka krasnaja grafted on 3 different seedling stocks and growing on its own roots was studied in order to determine the best depth for cultivation. On seedling rootstocks of the same variety cultivation should not be deeper than 10 cm., whereas on its own roots and on the other 2 types of rootstock cultivation down to 15 cm. would be safe. Cultivation to 20–25 cm. is recommended between the rows, and to 12–15 cm. between trees in the row, with spring dressings of fertilizer to accelerate regeneration of damaged roots.

3917. JOHNSON, R. A.
Apple trees need liming too.
Me Fm Res., 1960, **8**(3): 11-12.
In a relatively acid infertile soil potted McIntosh seedlings made increasingly better growth as the pH increased from 5·1 to 6·6. Seedlings of *Malus sargenti rosea* grew better as the pH increased from 4·4 to 6·2, and then growth decreased between pH 6·2 and 6·7. In another soil no differences in growth were obtained with pH values between 5·1 and 7·1.

3918. (TILL, M. R.)
Gypsum solutions not practicable for irrigated orchards.
J. Agric. S. Aust., 1960, **64**: 165.
Solid gypsum applied with organic material and worked into the soil is recommended for orchards on impervious soil with a poor structure.

3919. KOMLEV, A. A., AND JAKOVLEV, A. I.
Controlling soil erosion in orchards. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 35-6, illus.
In order to reduce the soil erosion which often accompanies a rapid thawing of the snow in spring, the snow was compacted with a heavy roller in strips up and down and across the slope. These compacted strips of snow thawed more slowly forming "cells" which retarded the run-off of water.

3920. TASMANIAN DEPARTMENT OF AGRICULTURE, HORTICULTURAL DIVISION.
Flood damage in orchards.
Tasm. J. Agric., 1960, **31**: 299-302, illus.
Notes on erosion, soil saturation, damage to trees by débris, the superficial covering of trees with grass and weeds and remedial measures.

3921. EREMEEV, G. N.
The question of drought resistance in fruit crops. [Russian.]
Sadovodstvo, 1960, No. 12, pp. 21-4, illus.
In moist soils active absorbing roots of apple, pear, peach, almond, apricot, plum and quince should be white coloured and at least 4–12 mm. long. In dry soils absorbing roots are very short, 2–4 mm., and are reddish brown in colour; in waterlogged soils roots turn dark brown. Examples are given of the poor development of absorbing roots of apple and apricot in dry soils [see also *H.A.*, 31: 296]. The intensity of transpiration of 11 different types of fruit plant was compared; *Malus floribunda* and apple varieties had the highest rate of transpiration, and apricots, peaches, olives and strawberries the lowest. The performance of 2 peach varieties on almond, apricot and plum rootstocks was studied on waterlogged and very dry soils. In the wet conditions trees on cherry plum survived the best, whereas in the dry conditions trees on almond were best.

3922. REYNTENS, H., AND DE BAERDEMAEKER, A.
L'année sèche 1959. Quelques résultats concernant les cultures fruitières de basses-tiges. **(The dry year 1959; some effects on the culture of low-stemmed fruit trees.)**
Rev. Agric., Brux., 1960, **13**: 784-6.
The effects of a very dry year on the results of various treatments in a soil management trial are discussed. Serious moisture deficiency was found on plots under a grass sward, and this reduced fruit production of pears but did not affect tree

growth. The drought also encouraged white clover at the expense of grasses in an established clover/grass mixture plot.

3923. Butijn, J.
Bodembehandeling in de fruitteelt. (Soil management in fruit-growing.) [English summary 14 pp.]
Thesis LandbHogesch., Wageningen, published as *Versl. Landbouwk. Onderz.* **66.7**, 1961, pp. 403, bibl. 30 pp., illus.

The influence of soil water management and rooting habit on fruit tree performance. The effect on tree performance of the rooting habit of several rootstocks on various profiles is discussed. Trials in soils with a limited variation in moisture content showed that the demand for water is highest when shoot growth is most vigorous. In wet soils (generally containing less than 10% air) growth begins normally but gradually slows down. The influence of soil moisture on fruit growth is much less than on shoot growth; when soil moisture was high at the critical period 1 to 2 months before harvest yields were only increased by about 10%. Fruit growth stops if the tree wilts, and the loss in growth is not made up after tree recovery. Moisture transport from a moist subsoil is too slow to prevent the wilting of plants in a nutrition zone (40 cm. of top soil) which has dried to wilting point. Nitrate uptake in particular seems to be impeded in a dry soil. In many soils used for fruit-growing in the Netherlands much of the total moisture supply to the fruit crop is provided by a capillary rise of ground water. The depth of the rooting zone is markedly restricted by high groundwater tables in spring and summer; a high table in winter does little damage. *Water management in a series of orchard soils in the south-west Netherlands.* Fruit production was reduced on both dry and excessively wet profiles. The moisture status of the whole rooting zone, and in particular the nutrition zone, is unfavourably affected by a permanent grass sward, but favourably by a mulch, in comparison with clean cultivation. A cover crop grown from late July until March will not compete with the trees for water at critical periods. *Relations between climatic and soil factors and water management.* The average water consumption by orchards in the south-west Netherlands is calculated to be 550 mm. per year. Summer evapotranspiration of a grass orchard was 10% higher than that of a clean cultivated orchard. The ratio Eg (evapotranspiration of a clean cultivated orchard) to Eo (the evaporation of open water) was 0·66 at the beginning of the summer, but increased to above 1·0. Calculations made on 2 soil profiles showed that a ground water level that will provide an optimum water status in the nutrition zone and also a satisfactory rooting depth is not a practicable possibility. *The influence of chemical soil properties on the fruit crop.* The factors related to the appearance in fruit trees of deficiencies of Mg, Fe, Zn and N are discussed, with methods of correcting these deficiencies. In wet soils nitrate, phosphate and K contents decrease, while Fe, Mn and Al contents increase. Losses from the soil by drainage and consumption are exceeded by the usual rates of nutrient dressings. *The practice of soil management in fruit culture.* From a review of existing soil management systems in the Netherlands it can be concluded that 2 systems are dominant: on river clay a permanent sward is maintained, while on sandy soils and on some marine clays clean cultivation in spring is followed by a volunteer cover of weeds. Examples of modern soil management systems are described.

3924. Puhtinskij, Ju. E.
A study of the influence of irrigation and cultivation on soil temperature. [Russian.]
Sadovodstvo, 1960, No. 7, pp. 35-7.

Root activity of apples was shown to be related to soil temperature. The application of 1,000 cu. m. of water per ha. in November, following a dry summer, increased minimum soil temperatures to a depth of 120 cm. in December. Minimum temperatures between 20–80 cm. were increased by 3–5° C. Critical temperatures for survival of apple roots were found to be about −14 to −15° C., for plums and cherries about −10°, and for vines about −7° C.

3925. Matthews, C. D.
Orchard irrigation.
Tasm. J. Agric., 1960, **31**: 393-401, illus.

Frequency, rates and methods are discussed. In Tasmania it is unlikely that 3 in. of water would be necessary at any one application. Furrow irrigation is best adapted to supplying 5–6 in. water at a time, consequently sprinkler irrigation seems most suitable for Tasmania. Various types of sprinkler arrangement and mains layout are discussed.

3926. Matthews, C. D.
Water and the Tasmanian apple grower.
Tasm. J. Agric., 1960, **31**: 346-51, bibl. 2, illus.

Drought in the 1960 season resulted in loss of fruit size and total crop and in delays in filling shipping space. The advantages and costs of installing an irrigation system are discussed.

Nutrition and tree composition.

(*See also* 3659, 3791, 3837, 3885, 3918, 3923, 4034-4037, 4039, 4220, 4233, 4242, 5148, 5149, 5560.)

3927. Devjatov, A. S.
Variations in the salt tolerance of woody plants in the course of ontogeny. [Russian, with English summary ¼ p.]
Bot. Žurnal, 1961, **46**: 39-50, bibl. 34.

The salt tolerance of woody plants, in particular of fruit trees, was found to be relatively high during the early years when vegetative growth was dominant and to decline with the advent of fruiting. The decrease in salt tolerance was apparently caused by a reduction in the vitality of the trees due to the depletion of nutrients by fruit and seed production. In apple varieties of the same age salt tolerance differed according to the stage of development and 4 categories were distinguished, those showing the greatest tolerance only responding to salt by a decrease in the longevity of the fruiting wood. Tolerance to soil salinity was increased by favourable ecological conditions and by cultural practices which promoted active growth without exhausting the trees. In the Lower Volga lowlands a concentration of 0·03% of Cl was toxic as a rule to apples during the predominantly fruiting stage, and 0·04% was toxic during the combined fruiting and growing stage.

3928. DRIJFHOUT, E.
Resultaten van het permanente bemestingsproefveld bij appels op het fruitteeltproefbedrijf te Numansdorp. I. Invloed van de bemesting op de vruchten. II. Invloed van de bemesting op de ontwikkeling van de bomen. III. Invloed van de bemesting op het optreden van gebreksziekten en op de gehalten aan voedingstoffen in de grond en in het blad. **(Results from the permanent manurial trial with apples at the experimental fruit farm at Numansdorp. I. The effect of manuring on the fruits. II. The effect of manuring on tree development. III. The effect of manuring on the occurrence of deficiency diseases and on the nutrient contents of the soil and the leaf.)**
Fruitteelt, 1961, **51**: 106-8, 128-30, 244-6.

Three levels of N, P and K were applied to a grassed orchard, and the following results were obtained. *Fruiting:* Yields were increased by about 10% when sulphate of ammonia applications were increased from 700 kg./ha. to 1,100 kg./ha.; yields were reduced by about 7% with no P, and at the lowest level of K (240 kg./ha. $K_2SO_4.MgSO_4$). As the rate of N application decreased there was a greater reduction in fruit number than in fruit size; high N resulted in poor fruit colour and low N in poor storage quality. *Tree development:* The first step in increasing N rates increased girths by 8%, while the difference with the second step was only 1%; similar trends were observed with the amount of prunings; differences in growth with K and P dosages were small; on one-year-old wood the number of mixed buds was doubled at the highest rate of N, but there was no increase of mixed buds on older wood; the number of flowers set per tree increased with increasing N, but the percentage set of mixed buds decreased with increasing N; N had the greatest influence on leaf health. *Nutrient contents in leaf and soil:* With increasing N levels there was a drop in leaf K and P contents; leaf Mg and Ca tended to be lower with low N; leaf contents of K and Mg were not affected by increasing rates of $K_2SO_4.MgSO_4$, nor were P contents increased by higher rates of superphosphate application; it appeared that with high N manuring fruit trees required higher contents of P and K in the soil. It was shown that tree susceptibility to K, Mn and Mg deficiencies varies with variety and rootstock. The application of 200 kg./ha. of superphosphate annually maintained the P-Al level in the soil. There was little leaching of K from the marine clay soil. The Mg contents of the soil increased with increasing rates of $K_2SO_4.MgSO_4$ application, and in normal years there was little leaching.

3929. VAN DER BOON, J., AND BUTIJN, J.
Invloed van bodemfactoren op Jonathan M.XVI, onderzocht volgens de proefplekkenmethode. **(The effect of soil factors on Jonathan on M.XVI, studied according to the experimental plot method.)** [English summary ½ p.]
Meded. Dir. Tuinb., 1961, **24**: 44-53, 62-3, bibl. 2.
Opbrengst van Jonathan op M.XVI en vruchtbaarheid van de grond. **(Yields of Jonathan on M.XVI in relation to soil fertility.)**
Fruitteelt, 1961, **51**: 376-7.

The differences in yield observed between trees on river clay and those on marine clay could only partly be attributed to soil factors. On river clay tree vigour was correlated with leaf N content at the beginning of June and with soil N content. The topsoil in a clean-cultivated orchard should contain at least 25 p.p.m. nitrate in June. On marine clay yields were favourably affected by a higher humus content and a low water table in the summer. The optimum K content of the top 20 cm. of soil was below 0·02% in light soil types and about 0·04% in heavier soils. Yields were reduced on soils with high phosphate contents. The incidence of canker was more severe on soils with a low humus content and where there was a big difference between the water table in the winter and in the summer. Deficiencies of Fe and Mn occurred on calcareous soils. There was no Fe deficiency when the soil content of Fe was above 3·8 p.p.m.—Inst. Bodemvr., Groningen, and Inst. Cultuurtech. Waterhuish., Wageningen.

3930. (DOLL, C. C.)
Test effects of fertilizer, mulch for apple orchards.
Ia Fm Sci., 1961, **15**: 672.

Applications of N to Jonathan apple trees increased the fruit size, decreased the red colour and had very little effect on yield. On Delicious apples size and colour were decreased and yields increased. Addition of P slightly reduced colour on Jonathans. Mulching also reduced colour on both varieties but gave increased yields. Measurement of trunk diameters showed little difference between the different fertilizer and cultural treatments.

3931. Overcash, J. P., Campbell, J. A., and Crockett, S. P.
Peach fertilizer and pruning experiments.
Bull. Miss. agric. Exp. Stat. **596**, 1960, pp. 23, bibl. 27, illus.

Early Elberta peach trees were fertilized with N at 1 lb. 16%, P at 1 lb. 20% super. and K at ¼ lb. 50% muriate per tree per year of age. After 6 years of age the 6-year rate was applied annually. Tree height and width, trunk circumference, weight of prunings and yields were measured. Tree growth was increased by applications of N or NPK but not by P or K. Yields were increased by K, P and N treatments, but N delayed fruit maturity. Tree height and trunk circumference were not affected by the severity of pruning but heavy pruning reduced tree width, delayed fruit maturity and reduced yields compared with light pruning. The rate of NPK application did not affect tree size or yield at any of the 3 levels of pruning severity.

3932. Sedov, E. N., and Sedova, Z. A.
Raising hybrid seedlings of apple and pear on soil fertilized with phosphorus and potassium. [Russian.]
Agrobiologija, 1960, No. 4, pp. 559-62.

See *H.A.*, 31: 1967.

3933. Gilani, A. G.
Stimulating the growth of seedling rootstocks with mineral fertilizers. [Russian.]
Sadovodstvo, 1960, No. 7, pp. 26-7.

P and K fertilizers (120 kg. P_2O_5 and 60 kg. K_2O/ha.) were the most effective in thickening the stem diameter and accelerating root development of wild seedling apple rootstocks, especially if they were applied with 5 tons compost per ha. in the layer of soil 15–25 cm. below the surface.

3934. Pašinová, G. B.
Kotázce účinnosti hnojení ovocných stromů pomocí půdních injektorů. **(The effectiveness of fruit tree nutrition by soil injection.)** [Russian and German summaries ⅓ p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 191-4.

NPK solutions applied by soil injection increased the area and chlorophyll content of the leaves of apple and cherry trees growing on roadsides or in permanent grass.

3935. van der Boon, J., and Kolenbrander, G. J.
Verplaatsing van stikstof naar de diepte in een grasboomgaard. **(The downward movement of nitrogen in a grass orchard.)**
Landbouwk. Tijdschr., 1960, **72**: 904-15. bibl. 21.

Soil analyses in the winter showed that the amount of water-soluble N in the top 5 cm. layer, three weeks after a fertilizer application, is dependent on the average day temperature and rainfall during this period. In one orchard on a loam soil only N from an application (120 kg. N/ha.) made in mid-December reached the soil 40–60 cm. below the surface. The penetration of N from later applications was much less.—Inst. Bodemvr., Groningen.

3936. Pankratova, E. M.
Increasing the physiological activity and yields of fruit trees by foliar nutrition. [Russian, with English summary ⅓ p.]
Fiziol. Rast., 1960, **7**: 584-90, bibl. 18.

Spraying apple and sour cherry trees with an NPK + B mixture increased in the leaves the activity of oxidizing-reducing enzymes such as dehydrogenase, catalase, peroxidase and ascorbic acid oxidase, but in most cases reduced the activity of polyphenoloxidase. The contents of ascorbic acid and iodine-reducing substances were raised, but the pH of the cell sap was not materially affected. These metabolic changes resulted in enhanced yields, reduced fruit drop and improved flavour.

3937. Ishihara, M.
Studies on foliar sprays of phosphates on fruit trees. Part 2. Fundamental studies on phosphate foliar sprays. Part 3. Observations on leaf injury by foliar sprays of various phosphates and studies on preventing leaf injury by mixing foliar sprays of phosphate solutions with lime or other chemicals. Part 4. The effect of foliar sprays of phosphates on young bearing Satsuma orange trees. [Japanese, with English summaries.]
Bull. nat. Inst. agric. Sci., Hiratsuka, Ser. E, 1958, No. 7, pp. 55-85, bibl. 14, illus., 1960, No. 8, pp. 97-120, bibl. 9, and 121-44, bibl. 45.

Foliar phosphate sprays on Japanese pear and apple seedlings produced the greatest increase in growth when combined with a soil application of phosphate. Japanese pear, peach, Japanese persimmon, grape vine and Satsuma orange trees were sprayed with a number of phosphate solutions mixed with lime or other chemicals and the amount of leaf injury was noted. Potassium monophosphate and calcium monophosphate caused very little injury to the Japanese pear, vine and peach, and the calcium monophosphate did not injure the Japanese persimmon. Satsuma orange showed only very slight injury with all the sprays. The addition of lime or other chemicals did not alter the effects of the sprays. In pot experiments with Satsuma orange trees ammonium monophosphate sprays improved growth, and phosphate sprays also increased flower set and the P content of the leaves. With Satsuma oranges ammonium diphosphate increased the leaf N content but decreased the K content, whereas potassium monophosphate increased N and K contents and decreased Ca. The results also suggested that where there is P deficiency the foliar spray would best be combined with a soil application. The phosphate sprays increased fruit size and weight, % juice and the acid/sugar ratio but decreased the % fruit rind and citric acid content. [For Part 1 see *H.A.*, 25: 2478.]

3938. Baldini, E.
Effetti della concimazione azotata epigea a base di urea su alcune caratteristiche delle foglie di melo. **(The effects of foliar application of nitrogen in the form of urea on certain characteristics of apple leaves.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 347-54, bibl. 18, illus.

Trees of 5 apple varieties sprayed twice (at petal fall and 3 weeks later) with 0·5% urea plus a wetting agent developed leaves with a greater area, thicker mesophyll, looser spongy tissue and higher contents of chlorophyll and nitrogen than those on the control trees sprayed with water.—Ist. Coltiv. arb., Univ. Bologna.

3939. Dilley, D. R.
The assimilation of isotopic carbon and nitrogen labeled urea into the amino acids of apple and peach leaves.
Diss. Abstr., 1960, **21**: 1356, being *L.C. Card No. Mic.* 60-3721 of 107 pp.

Urea absorption by peach leaves was increased by pre-treatment with acetone, which indicates that certain cuticular components, dissolved by acetone, restrict the foliar absorption of urea. The isotopic carbon and nitrogen of urea were readily incorporated into amino acids, amides and protein when supplied through the petiole. Urea hydrolysis proceeded at a greater rate in peach than in apple leaves.—N.C. St. Coll.

3940. Thomas, L. A.
The time of maturity of apples influenced by foliar sprays.
J. Aust. Inst. agric. Sci., 1960, **26**: 360-3, bibl. 2.
Extending the apple harvest.
Rur. Res., C.S.I.R.O., 1961, No. 35, p. 13, bibl. 1.

Borax and urea were applied to the foliage, separately and together, as 0·5% and 1·0% solutions, respectively. With Jonathan in 3 seasons borax sprays advanced maturity. Urea alone delayed maturity in 2 years out of 3, but when added to the borax spray it had no effect in 2 years and further advanced maturity in the third year. Borax application increased the conversion of starch to sugars, but urea retarded starch conversion. There was some evidence that borax sprays increased fruit acidity.—C.S.I.R.O., Applethorpe, Qd.

3941. Drijfhout, E.
Mangaangebrek bij vruchtbomen en de bestrijding ervan. **(Manganese deficiency of fruit trees and its control.)**
Fruitteelt, 1961, **51**: 162-4, illus.

In trials with various materials to control Mn deficiency in apples, the best results were obtained with Tricarbamix, which is a mixed carbamate spray containing ziram, ferbam and manam.

3942. Satō, K., Ishihara, M., and Kurihara, A.
The effect of calcium application and pH on the growth and on the leaf and tree composition of the main fruit trees.
Bull. nat. Inst. agric. Sci., Hiratsuka, Ser. E, 1960, No. 8, pp. 77-96, bibl. 21, illus.

In sand culture experiments Ca deficiency symptoms were observed first in olive and grape vine, followed by apple, loquat, peach, Japanese persimmon and finally Japanese pear and chestnut. Excess Ca did not affect tree growth. A soil pH value of 4 depressed growth only in the case of the olive and grape vine, but a pH value of 3 also depressed the growth of Satsuma orange seedlings. Japanese pear required a minimum Ca level of 5 p.p.m., whereas the grape vine required a minimum of 30 p.p.m.

3943. Bogdanova, N. S.
The appearance of chlorosis on apple trees in the Ul'janovsk region. [Russian.]
Sadovodstvo, 1960, No. 11, pp. 40-2.

Chlorosis frequently occurs in this region on soils with a high humus content overlying marl. The root systems of two apple rootstock varieties suffering from chlorosis were found to be much smaller than those of unaffected trees, the air-dry weight of the roots and the number of fibrous roots being lower. A large number of seedlings were tested; seedlings of Kitajka and Antonovka were generally resistant to chlorosis, whereas 30% of Siberian apple seedlings became chlorotic.

3944. Butijn, J.
Het stikstofbemestingsadvies in de fruitteelt. **(Advice on nitrogen manuring in fruit growing.)** [English summary ¾ p.]
Meded. Dir. Tuinb., 1961, **24**: 120-32, summary 142-3, bibl. 18.

The values are discussed of the leaf N content/yield ratio and of soil contents of NO_3 as bases for manuring apples and pears. At present the results of such analyses can only indicate the general needs, and not the exact quantities.—Inst. Cultuurtech. Waterhuish., Wageningen.

3945. Lieu, P. S.

The effect of diurnal variation in sampling, and effect of methods of preparation and storage of samples on the total nitrogen and mineral content of apple leaves.

Diss. Abstr., 1960, **21**: 720-1, being *L.C. Card No. Mic.* 60-4110 of 106 pp.

Leaf samples collected from Richared and Starking showed that contents of N, P, K, Ca, Mg, Mn, Fe, B and Cu were slightly, but not significantly, higher in the morning than in the afternoon. Leaves held at room temperature for 8 to 32 hours before drying had higher contents of all nutrients except P and Ca than those dried immediately after sampling or kept for 2 to 4 hours. It appeared that tap water plus a weak solution of either HNO_3 or H_2SO_4 (depending on the method of grinding) was effective for washing without causing undue leaching. The two methods of grinding leaf samples tested (Wiley Mill and porcelain mortar and pestle) had no effect on the contents of macronutrients; Cu was significantly higher in samples ground by Wiley Mill, and Fe was higher in samples ground by porcelain mortar and pestle. There were no significant differences in the final contents of nutrient elements (except Cu) between freezing leaf samples for 48 hours before drying at 75° C., and immediate drying at 75° and 100° C. Samples dried by lyophilization had nearly the same nutrient element content as those dried by heat. In general, length of storage had little or no effect on nutrient content. No significant differences were found in the nutrient element contents of samples stored for 3 months at 34° F. at 26% and 86% R.H.—Ohio St. Univ.

3946. Trzcinski, T.

Un essai préliminaire sur la répartition de l'azote dans une feuille de pommier. (**A preliminary study of the distribution of nitrogen in the apple leaf.**)

Rev. Agric., Brux., 1960, **13**: 775-80.

The nitrogen contents of the base of the petiole, the whole petiole, the midrib and the right and left portions of the lamina were determined by the semi-micro Kjeldahl method. Results showed that the N content was higher in the base of the petiole than in the petiole itself. The N content of the midrib was lower in leaves from the middle of the branch, since they were larger than those at either end; it also varied greatly in different portions of the lamina.—I.R.S.I.A.

3947. Fedorov, N. I.

Carbohydrate metabolism in wild Chinese apple trees during the post-planting period and its importance for subsequent growth. [Russian.]

Fiziol. Rast., 1961, **8**: 117-19, bibl. 5.

Changes in the total carbohydrate, starch, monosaccharide and disaccharide contents of the shoots, stem and roots of Kitajka [*Malus prunifolia*] in the spring after autumn planting are graphically illustrated. At the end of April the content of carbohydrates, and in particular of disaccharides, was much higher in bursting buds than in those which remained dormant.

3948. Rjadnova, I. M.

Qualitative changes in fruit buds during winter. [Russian.]

Bot. Žurnal, 1960, **45**: 1506-11, bibl. 6.

The effects of winter temperatures on the development of flower primordia and the accumulation of starch in fruit buds were studied in *Prunus domestica* and *P. salicina*. Low temperatures slowed down development of flower primordia, increased the accumulation of starch in fruit buds, and increased winter hardiness. Starch accumulated more rapidly in buds of *P. salicina* than in *P. domestica*. Buds of apricot, peach, plum and cherry were also examined for the presence of plasmodesmata in two winters. Plasmodesmata were shown to be absent during the coldest parts of both winters.

3949. Friedrich, H.

Untersuchungen über die phenolischen Inhaltsstoffe von *Pyrus communis* L. 7. Mitteilung: Pyrosid. (**Phenolic constituents of *Pyrus communis*. 7th communication. Pyroside.**)

Pharmazie, 1960, **15**: 650-4, bibl. 12, illus.

The arbutin-like substance in pear leaves [see *H.A.*, 31: 293] has been identified as the acetic acid ester of arbutin and the name pyroside is proposed for it.—Inst. KultPflForsch. Gatersleben, Berlin.

Growth and physiology.

(*See also* 3689, 3921, 3936, 4199, 4205, 4334.)

3950. Maggs, D. H.

The stability of the growth pattern of young apple-trees under four levels of illumination.

Ann. Bot., Lond., 1960, **24**: 434-50, bibl. 37.

Uniform 1-year-old rooted plants of MM.106 carrying two new shoots were grown in pots for a season under 100, 78, 41 or 24% natural light. Weights of leaf, new stem, old stem and root were determined by sampling on 6 occasions. The dry weight increments over the whole season ranged from 17 to 151 g., of which, in full light. 22% was leaf and 22% root; in deep shade 32% was leaf and 8% root; and under all conditions

56–60% was stem. These percentages were the cumulative result of current rates of growth of leaf, stem and root over the whole growing period. The rates were not constant relative to one another, but the much greater quantity of growth made over the period 100–200 days from bud-break swamped earlier differences. All treatments showed the same basic pattern of growth, with minor differences increasing with the intensity of shading. These differences are discussed in relation to utilization of reserves and the demands of the various regions of the plant. The response to shading was analysed into the effects of reduced light interception, increased leaf dispersion, increased leaf proportion, reduced length of growing season, and lighter leaf weight at the beginning of the 20-leaf stage. The result of these factors was a doubling of the growth expected in the absence of response. It was concluded that the pattern of growth is stable, and the conditions for the perpetuation of such stable patterns as a necessary qualification for tree growth are briefly discussed. [From author's abstract.]—E. Malling Res. Stat., Kent.

3951. Knight, R. C.
Taper and secondary thickening in stems and roots of the apple.
A.R. E. Malling Res. Stat., 1960, 1961, **A44**: 65-71, bibl. 6, illus.

Observations are reported on the onset of secondary thickening on old stems and roots of apple trees. Secondary thickening started below newly growing shoots and developed rapidly downwards until it reached ground level in May. Subsequent development was very much slower, and did not always reach the base of the stem underground. As a result of this, the normal taper towards the tip of the stem was reversed below ground level. Partial disbudding reduced the rate at which the wave of thickening travelled down the stem and the amount of thickening. When some trees were replanted deeply, the wave of thickening was slowed at the new ground level and a new position of reverse taper was initiated. In a series of 14-year-old trees [in which transverse sections were cut in the trunk at intervals below the junction with the lowest branch and the diameters of the annual rings were measured] the position of minimum diameter on the trunk was at first 5–10 cm. below the branches, and within 4 years descended to about 20 cm. below the branches, where it remained for the last 11 years. New adventitious roots began to grow from the stem base shortly before bud development was apparent, and cambial activity in the old roots started as a wave proceeding from the old stem junction towards the root tips before the wave of stem activity reached the stem base. New roots also grew from the tips of the old roots before the root wave reached them. The onset of cambial activity in the roots was not related to their depth nor to their positions relative to the branches. [Author's summary.] [The author of this paper died in 1935 and the manuscript only became available recently. It has been published because of its obvious bearing on various current investigations on the nature of tree growth.—Ed.]

3952. Pašinová, G. B.
Studium kořenové soustavy ovocných stromů v silničních stromořadích. (**A study of the root systems of fruit trees grown along highways.**) [Russian and German summaries 1 p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 171-88, bibl. 45, illus.

The root systems of 30 roadside apple trees of different varieties 14–40 years old, were investigated by 3 methods. In only a few cases did the roots spread further laterally than the crowns, and then generally not more than 50–100 cm. beyond the crowns. The growth and distribution of roots of trees on level ground at different distances from the road and of trees on slopes above ditches varied. No differences in root distribution due to orientation were noted. Between 10 and 20% of the roots were found at a depth of 0 to 20 cm., 30–60% at 20–40 cm., 20–40% at 40–60 cm. and 15% at 60–80 cm. In wet weather the moisture content of the surface soil was 31%; at a depth of 30–60 cm. it was only 14%; and at 80 cm. it was 20–22%, at which depth it was no longer affected by climate. With increasing root density, in given layers, the soil moisture content declined.

3953. Kolesnikov, E. V.
The study of the root system of fruit trees by the adsorption method. [Russian, with English summary 10 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 4, pp. 34-42, bibl. 10, illus.

Methods of estimating the adsorbing and absorbing surfaces of apple seedling roots by measuring the uptake of methylene blue, and of calculating the total effective absorbing surface area by measuring length, breadth, root hairs, etc., are described. The absorbing surfaces of apple and cherry seedlings in sand culture with full nutrient solution were in the ratio 195 : 176; the absorbing surface of apple seedlings in a minus P solution increased to 332. Investigations showed that the roots of cherry and plum grew better in the autumn than those of apple and pear, whereas in the winter the latter grew better than the former. Growth of shoots of newly planted trees in the first year after planting was found to be related to the number of vigorously growing roots at the time of planting, and for spring planting cutting the roots the previous autumn is recommended. By measuring the growth of roots and fruit daily in July and August it was shown that, if the growth of roots increased, the growth of fruit decreased and *vice versa*.

3954. PEN'KOVA, R. M.
Types of branching in apple trees. [Russian.]
Bot. Žurnal, 1960, **45**: 1530-6, bibl. 6, illus.
Monopodial branching was the main type found in young trees before they started fruiting. With advancing maturity more sympodial branching occurred. In 20-year-old trees the types of branching varied from 65 to 90% monopodial, from 9 to 31% sympodial and from 0·5 to 9·0% pseudo-dichotomous branching, according to variety. Monopodial branching was found to be typical of vegetative growth, whereas sympodial branching stimulated fruiting. Pinching out of green shoots was found to induce sympodial branching.

3955. ZAJCEV, G. N.
The relationship between fruit weight and precocity in vigorously growing varieties of apple. [Russian.]
Bot. Žurnal, 1960, **45**: 1511-16, bibl. 13.
Examination of records of 34 varieties of apple showed a close relationship between the number of years before fruiting and fruit size, the larger fruited varieties taking longer to come into bearing.

3956. DERMEN, H.
Adventitious bud and stem relationship in apple.
J. Wash. Acad. Sci., 1958, **49**: 261-8, bibl. 8, illus.
The origin and development of adventitious buds is traced in distinction from latent buds. Unlike the latter, true adventitious buds have no vascular connexions through the wood below them. When initiation is induced by cutting back the shoot, adventitious buds in the nodal region originate in the callused tissue and those in the internodes from the phloem.—U.S.D.A., Beltsville, Md.

3957. GYURÓ, F.
Rügydifferenciálódási vizsgálat néhány almafajtán. (**Bud differentiation in some apple varieties.**) [Russian and German summaries ½ p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 135-42, bibl. 20.
Fruit bud differentiation in the majority of apple varieties in Hungary occurs between 10 and 20 July. Pruning delayed bud differentiation; in unpruned Jonathan trees this occurred at the beginning of July, whereas thinning the crown retarded it to the middle of July, and cutting back the branches to the end of July. In Jonathan bud differentiation started about 4–5 weeks after the end of shoot growth.

3958. LALATTA, F., AND BERNARDELLI, A.
Influenza della curvatura dei rami, dell'anellazione e dell'asportazione di foglie sulla formazione delle gemme a fiore nel melo Abbondanza. (**The effects of branch curvature, ringing and defoliation on the formation of flower buds in the apple variety Abbondanza.**)
Ann. Fac. Agrar., Milano, 1958 (issued 1959), **7**: 7-40, bibl. 1.
Apple branches one year old, fixed in a downward curve during July, in most cases produced fewer flower buds, and on the average a slightly lower proportion of flower buds to total buds, than the erect control branches. Where the bending was carried out in September the difference was even more marked. Ringing enhanced the effect of bending, especially in the later treatment. Flower buds were also less numerous on shoots partially defoliated early in July than on those not defoliated, but where the leaves were not removed until mid-September the effect was not manifest. By adopting different patterns of defoliation, it was shown that the effect was not localized in the nodes involved but was diffused over the whole shoot.

3959. MIŠIĆ, P. D.
Dinamika cvetanja raznih sorti jabuka. (**Studies on apple flowering.**) [English summary 2 pp.]
Arh. poljopr. Nauke, 1960, **13**(42): 12-34, bibl. 9.
Among the results obtained in this study of the behaviour of 231 apple varieties are the following: flowering is more dependent on the scion variety and on weather conditions than on the rootstock; early flowering varieties produced more blossom than mid-season and late varieties; flowering in the different period groups overlapped sufficiently for cross-pollination to occur between adjacent groups; the existing early flowering and early ripening varieties are suitable breeding material for new earlier ripening varieties; the late flowering varieties are valuable for the breeding of new varieties for localities liable to late frosts.—Inst. Fruit Growing, Čačak.

3960. ČELJADINOVA, A. I., NIKITSKAJA, K. I., AND LIMONOVA, L. A.
The development of flower buds in cherries. [Russian.]
Sadovodstvo, 1960, No. 7, pp. 33-5, illus.
Stages of development of flower buds are described and illustrated.

3961. PEJKIĆ, B.
Secondary flowering and fruiting in some plum varieties. [Yugoslav, with English summary 1 p.]
Zborn. Rad. poljopriv. Fak. Beograd, 1959, **7**(280): 1-10, bibl. 13, llus.
Defoliation caused by a severe hailstorm on

26 August in the hot dry summer of 1958 was followed by a secondary flush of both leaves and flowers on plum trees; pollination and normal fertilization occurred. The percentage of fruit set was higher on the varieties Dženarika and Požegača than on Belošlijiva, but on 11 October the average size of fruit on the latter was the greatest.

Planting, training and pruning.

(*See also* 3722, 3828, 3830, 3931, 3953, 3957, 3958, 4200, 4244, 4245.)

3962. Imamaliev, A.
The removal of leaves from fruit tree transplants. [Russian.]
Sadovodstvo, 1960, No. 9, pp. 23-4.

For defoliation in the nursery 0·25% magnesium chlorate was most suitable for apples and 0·075% endothal for pears and cherries. Both defoliants were highly effective at 20–25° C., less satisfactory at 8–12° C. and completely ineffective at 5–7° C. They were also more active at high than at low soil moisture contents. The defoliated plants contained 7–8% more moisture than the controls; they lignified more rapidly and some autumn and winter varieties showed increased frost resistance.

3963. Rjadnova, I. M., and others.
The spacing of fruit trees and bushes in orchards. [Russian.]
Sadovodstvo, 1960, No. 11, pp. 16-22, illus.

In a trial with 2 varieties of peach the spacings resulting in the highest yields in the first year of fruiting were 2 × 2 m., 2 × 2 × 4 m., 3 × 3 m. and 3 × 3 × 6 m. Yields from the 2 × 2 m. and 2 × 2 × 4 m. spacings fell after 4 years, by which time much unfruitful wood had developed in these trees. In another trial it was shown that raising peach trees in their fruiting positions, without transplanting, increased early yields.

3964. Esajan, G. S.
The spacing of fruit trees in relation to the optimal size of the crown. [Russian.]
Sadovodstvo, 1960, No. 12, pp. 19-21.

The distribution of fruit on skeletal branches of different lengths was analysed for 5 varieties of apple. On branches up to 7 m. long it was found that more than 76% of the total yield was always borne on the most distal 2 m. In 2 apricot varieties maximum yields were obtained with a crown 4–4·5 m. high and 4·5–5 m. in spread, that is, on third and fourth order branches. Under Armenian conditions closer planting than has been customary is advised, 9 × 9 m. being suggested for apricots and for most varieties of apple.

3965. Leonov, I. M.
Spacing of fruit trees in Siberia. [Russian.]
Sadovodstvo, 1960, No. 9, pp. 16-18.

In Siberia, where the majority of apple trees are small-fruited and short-lived, either planting 2 trees 15–20 cm. apart per hole at 4 × 4 m. or spacing single trees at 5 × 2·5 m. has given the highest yields per unit area. With large-fruited apples grown in prostrate form, setting 2 plants per hole and training in opposite directions along the row has given the best results.

3966. Kaleganov, A.
Planting trees in prostrate form. [Russian.]
Sadovodstvo, 1960, No. 9, pp. 18-20.

In Siberia all large-fruited apples are grown in prostrate form. In trials on methods of planting, trees planted vertically and bent at an angle of 30–50° to the soil surface at a stem height of 10–15 cm. grew more vigorously, and showed less stem injury from fluctuating spring temperatures, than those planted initially at an angle of 35–45°.

3967. Johansson, E.
Stamhöjdsförsök med äppleträd. **(Studies on stem height with apple trees.)** [English summary ¾ p.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 31-8, bibl. 4, illus.

Two stem heights (45 and 80 cm.) were compared in a trial at Alnarp, which included 3 varieties and 2 stocks. Most of the differences in growth and yield favoured trees on the shorter stem, but they were not significant. Shorter stems are, nevertheless, preferred for easier management.

3968. Ricci, —., and Branzanti, —.
Le moderne forme di allevamento in frutticoltura. **(Modern systems of training fruit trees.)**
Inf. Ortofruttic., 1960, **1**: 139-42, illus.

Observations on the advantages of free or semi-free palmette forms of pome- and stone-fruit trees. [See also *H.A.*, 31: 1991.]

3969. Preston, A. P.
A novel way of training fruit trees.
Amat. Gdng, 1961, **78**(3980): 12, illus.

Growing apples and pears as free palmettes is favoured in northern Italy. Trees planted 10 or 12 ft. apart in rows are trained onto 8-ft. bamboo canes in the form of St. Andrew's crosses or inverted V's. The central leader is tipped by about ⅓ and the laterals are tied nearly horizontally. The method is based on the fact that the horizontal branches are usually more fruitful than the vertical, and that the less a young tree is pruned, the earlier will it fruit.

3970. Gyuró, F.
A metszés hatása a levélfelületre. **(The effect of pruning on leaf area.)** [Russian and German summaries 1 p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 123-33, bibl. 9.

Branches of bearing Jonathan apple trees were pruned before bud burst with 4 degrees of severity, the controls being left unpruned. The total leaf area produced decreased as the severity of the pruning increased, being 126% of the leaf area on the controls with very light pruning, 120% with light, 117% with medium and 105% with severe pruning. On the shoots arising from the pruned branches, however, the leaf area increased with the severity of the pruning, the decrease being on the pruned branch itself. Whereas with light and very light pruning about 50% of the total leaf area was produced by the new shoots, with the severe pruning the percentage was 70–80.

3971. ANON.
Pruning your older apple trees.
West. Fruit Gr, 1961, **15**(2): 19-20, illus.

In a block of 50-year-old Winesap trees one row of 9 trees was spur-thinned, removing 50% of the spurs, particularly those over 5 years old, and the fruit was size-thinned; another row was size-thinned only and a control row was pruned by a standard method and the fruit was space-thinned. At the end of a 3-year period the spur-thinned trees with size-thinning had required 85 man-hours of total labour, whereas fruit thinning on the trees which were not spur-thinned had required 98½ man-hours. Spur-thinned trees gave a total of 1,178 boxes of loose fruit, whereas the trees which had been fruit-thinned only produced 1,355 boxes of loose fruit with a slightly higher proportion of smaller and low grade fruit. The controls produced 872 boxes.

3972. RIZZI, A. D., AND OTHERS.
Pruning in California.
West. Fruit Gr, 1960, **14**(12): 17-20, illus.

In a series of 4 short articles attention is drawn to modern trends in the training and pruning of stone fruits, apples and pears, and grape vines. The first 3 deal mainly with methods of training to facilitate mechanical harvesting [see also *H.A.*, 31: 2001]. The last article reports on an experiment on Emperor vines which has shown that water sprouts arising from old wood can profitably be cut back to form fruiting spurs, thus allowing the unproductive arms to be shortened.

3973. EDMUNDS, P. N.
Pneumatic gun pruning cuts costs.
Grower, 1961, **55**: 320-1, illus.

A description is given of a tractor-drawn apparatus with 6 pruning guns attached to hoses which are run out along a high T frame, so that 4 rows of fruit trees can be pruned at once. The guns can cut branches up to 1 inch in diameter. A 30–40% saving in time is achieved by this method compared with hand pruning.

3974. MURSELL, P.
£150—and two men can do the work of three.
Grower, 1961, **55**: 762-4, illus.

Pneumatic pruning in an English orchard involves a capital expenditure of £150 per man.

Pollination and fruit set.

(*See also* 4330, 4331, 4340.)

3975. JOHANSEN, C.
Pollination of tree fruits in eastern Washington.
Bett. Fruit, 1961, **55**(7): 5-7, 21, bibl. 13.

A review of methods which were successful in various situations.

3976. RAPHAEL, T. D., AND CUNNINGHAM, D. G.
Bees and pollination.
Tasm. J. Agric., 1960, **31**: 287-94, illus.

Measures to ensure satisfactory cross-pollination in orchards.

3977. SHARMA, P. L.
The honeybee population among insects visiting temperate-zone fruit flowers and their role in setting fruit.
Bee World, 1961, **42**: 6-8, bibl. 8.

When pollinating insects were prevented from visiting the flowers, fruit set of apples (Red Delicious, Golden Delicious and American Mother), pears, plums and cranberries was poor. Persimmons, peaches and cherries did not depend on pollinating insects for commercial set, but set was increased when insects could reach the flowers. Bees formed the majority of the pollinating insects.—Indian agric. Res. Inst., Pusa, Bihar.

3978. FREE, J. B., FREE, N. W., AND JAY, S. C.
The effect on foraging behavior of moving honey bee colonies to crops before or after flowering has begun.
J. econ. Ent., 1960, **53**: 564-6, bibl. 3.
FREE, J. B., AND SMITH, M. V.
The foraging behaviour of honeybees from colonies moved into a pear orchard in full flower.
Bee World, 1961, **42**: 11-12, bibl. 1.

Some bee colonies were taken to crops, including peach, cherry and apple, before flowering, and others after flowering had started. The proportion of bees visiting the crops was higher when their colonies were moved after the beginning of flowering than when moved before any of the flowers had opened. Better pollination of pear flowers, which are liable to be neglected by bees, was achieved by delaying the removal of the colonies to the orchard until flowering was well advanced.—Ontario agric. Coll., Guelph.

3979. Fetisov, G. G., and Filimonova, G. A.
The effects of different methods of emasculation of buds on the effectiveness of artificial pollination of fruit trees. [Russian.]
Agrobiologija, 1960, No. 3, p. 463.

Experiments showed that removal of the petals at the time of emasculation reduced fruit set slightly with pears and drastically with plums and cherries. With 2 varieties of pear removal of the petals reduced the percentage of good seeds.

3980. Ostapenko, V. I.
The physical and biochemical characteristics of the pollen and pistils of some fruit plants of the family Rosaceae. [Russian, with English summary ¾ p.]
Fiziol. Rast., 1960, **7**: 537-46, bibl. 18.

The pollen of apples, pears and species of *Prunus*, although varying considerably, was in general characterized by low pH and high activity of oxidizing and reducing enzymes. The grains contained some polyphenols, sulphhydryl groups, carbohydrates and, in some cases, a little fat. Sugars, but not starch or fat, were found in the pistil. The surface tissues of the stigma, the conducting tissues of the pistil and the embryo sac showed low acidity, low enzyme activity and practically no polyphenols or sulphhydryl groups. During pollination a complex of enzymes passed from the pollen to the stigma, and the pollen tube made use of nutrients from the pistil.

3981. Lunati, U.
La fecondazione negli alberi da frutto. (**Fertilization in fruit trees.**)
Frutticoltura, 1961, **23**: 39-48, bibl. 1.

Suitable pollinators are listed for the principal varieties of apple, pear, plum, quince, sweet and sour cherry, peach, apricot and persimmon.

3982. (Bailey, B. H.)
Pear pollination studies.
J. Agric. Vict., 1961, **59**: 125-6.

Yield data are presented, which show increased yields from Packham trees cross-pollinated with either Josephine or Winter Nelis pollen, and from Williams' interplanted with Buerré Bosc.

3983. Pisani, P. L.
Contributo allo studio della biologia della fecondazione delle cultivar di pero Morettini.) (**A contribution to the study of the biology of fertilization in Morettini pear varieties.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 355-63, bibl. 8, illus.

Butirra Precoce was self-incompatible and formed practically no parthenocarpic fruits. Butirra Rosata and Early Williams', although not self-compatible, formed a few parthenocarpic fruits. Santa Maria benefited from cross-pollination, although self-compatible. Suitable pollinators are listed for the 4 varieties. Fruit set was affected in the first 3 varieties by the weather at the time of anthesis. —Centro Miglior. Piante Frutto Orto C.N.R., Firenze.

3984. Mišić, P. D.
Proučavanje bioloških i citogenteičkih odlika domaćih sorti krušaka. II Deo. Proučavanje cvetanja, odnosa oplodjavanja, partenokarpije i klijavosti semena. (**Studies on the cytogenetical and biological characteristics of indigenous pear varieties. II. Studies on flowering, fertilization, parthenocarpy and seed germination.**) [English summary 2 pp.]
Arh. poljopr. Nauke, 1960, **13**(39): 54-70, bibl. 18.

In artificial pollination trials with 24 Yugoslavian pear varieties 49 combinations of the 60 tried were compatible. Although 4 varieties were self-compatible, in no case was fruit set satisfactory enough to permit the planting of orchards with single varieties. Open pollination resulted in a higher percentage of viable seeds than artificial pollination, and 4·2% of the seedlings were polycotyledonous. [For part I see *H.A.*, 30: 4923.] —Inst. Fruit Growing, Čačak.

3985. Burts, E. C., and Kelly, S. G.
Seed abortion and fruit drop in Bartlett pear caused by Sevin.
J. econ. Ent., 1960, **53**: 956-7, bibl. 1.

Sevin 50% at 2 lb. per 100 gal. applied on 11 May, 2 June and 17 July reduced the number of seeds per fruit, increased the percentage of seedless fruit and caused a heavy pre-harvest fruit drop. [For effects on apples see *H.A.*, 31: 323.]—Tree Fruit Exp. Stat., Wenatchee, Wash.

3986. Modlibowska, I.
Stimulation of fruit development in frost damaged pears.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 46-8, bibl. 2.

The effect of gibberellic acid and 2,4,5-trichlorophenoxypropionic acid on the development of frost damaged pear flowers into fruits was investigated. GA proved most promising in stimulating seedless fruit development in several varieties, both when applied before or after flowering. GA treatment may have commercial possibilities and requires further research. [Author's summary.]

3987. Singh, S. N.
Studies on the pollen germination of peaches.
Hort. Advance, 1959, **3**: 76-81, bibl. 4.

Ten per cent sucrose solution was found to be the optimum concentration for peach pollen germination and tube growth. There were considerable varietal differences in percentage germination. —Hort. Res. Inst., Saharanpur, U.P.

3988. Bulatović, S.
A contribution to the study of the flowering period and of the causes of bud, flower and fruit drop in peaches in the Danubian region near Smederevo. [Yugoslav, with English summary 4 pp.]
Zborn. Rad. poljopriv. Fak. Beograd, 1959, 7(278): 1-71, bibl. 82, illus.

During 1951–1955 the earliest flowering date of the 6 peach varieties studied was 18 March and the latest 21 April. The duration of the flowering period varied with variety and season. Weather conditions which increased transpiration, such as high temperatures, low humidity and wind, shortened the duration of flowering, whereas conditions which reduced transpiration prolonged the flowering season. Flower-bud drop showed great varietal and annual variations, the major factor being low temperatures during dormancy, and flower drop showed similar variations. Five of the varieties observed were self-fertile and produced viable pollen which germinated very well *in vitro*, but both flower and fruit drop were greater from self-pollination than from open-pollination. Fruit drop occurred in 2 stages, 15 days after petal fall and again 15 days later, and was also affected by variety and season. Factors reducing fruit drop included satisfactory pollination and favourable weather conditions. More flowers and fruit dropped from weak than from vigorous branches. The application of N at the beginning of the growing period tended to reduce flower drop, but treatment with N after petal fall did not affect fruit drop. Morettini No. 1 proved to be the most consistent bearer followed in descending order by Waddel, Alexander, Red Bird, Mayflower and J. H. Hale. The 3 last named varieties should be pruned lightly, whereas the 3 heavier bearers should be pruned harder and their fruit thinned.

3989. Ministry of Agriculture, London.
The pollination of plums.
Adv. Leafl. Minist. Agric., Lond. **485**, 1960, pp. 3.

Fertility grouping and flowering periods.

Fruit thinning and development.

(*See also* 3971, 3985, 4193.)

3990. Hardisty, S. E., and Shorter, N. H.
Chemical thinning of apples.
J. Agric. W. Aust., 1960, **1**: 937-41, illus.

Recommended practices.

3991. Schumacher, R.
Wissenswertes über die chemische Frucht-Ausdünnung. (**Information on chemical fruit thinning.**)
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 175-80.

Naphthylacetamide is recommended for thinning apple fruits. The spray should be applied 10 days after petal fall, when weather conditions are settled and the temperature is 10–15° C. The concentration of the growth substance required depends both on the variety and on environmental conditions.—Eidg. Versuchsanst., Wädenswil.

3992. Greenhalgh, W. J.
Sevin—an insecticide with fruit thinning properties.
Agric. Gaz. N.S.W., 1960, **71**: 664-7.

Jonathan, Delicious and Granny Smith apple trees were drench-sprayed with Sevin 50% w.p., at 2 lb./100 gal., 10, 15, 20, 25 or 30 days after full bloom. Two additional treatments comprising NAA at 10 and 15 p.p.m. and a chemically purified Sevin spray were also applied at the 15-day period. Fruit set was reduced on all 3 varieties sprayed with Sevin, the amount of thinning being similar to that obtained with NAA. Less thinning occurred with Sevin applied at 30 days than with earlier applications, but an improvement in fruit size was noted in all cases. Only mild thinning occurred on pears.

3993. Denne, M. P.
Observations on cell size and number in relation to fruit size in apples.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 120-2, bibl. 4.

Fruit samples were collected from 32 8-year-old dwarf pyramid trees of Cox on M.VII. Variations in fruit size within a tree were found to be related to both size and number of cells in the cortex. Differences in fruit size between trees carrying different numbers of apples were also related to cell size and number. Thinning on 13 July, i.e. after the June drop, appeared to increase fruit size by increasing cell number during the first few weeks after thinning. There was probably also an effect on cell size.

3994. Marro, M.
L'impiego dei regolatori contro la cascola delle mele avanti la raccolta. (**The use of growth regulators to prevent pre-harvest drop of apples.**)
Frutticoltura, 1961, **23**: 93-118, bibl. 83.

A review.

3995. Jacobsen, J. V.
Stone fruit trials.
J. Agric. S. Aust., 1960, **64**: 53-5, illus.

In trials on unpruned Wights clingstone peach trees, using DNC, DNBP and maleic hydrazide as flower thinners and chloro-IPC, maleic hydrazide and NAA as fruit thinners, chemical thinning was found to be ineffective on unpruned trees. A full-bloom spray of 0·12% TMTD or 0·1% captan is recommended for the control of brown rot; a spray of 0·05% PMC on nectarines at full bloom caused severe damage. Trials on Moorpark and Trevatt apricots showed that only the triethanolamine salts of 2,4,5-T and 2,4,5-TP were safe to apply and that both hormones caused minor tree damage. 2,4,5-TP advanced maturity a little more than 2,4,5-T, but the latter at 25 p.p.m. gave a heavier crop and good fruit size.

Fruit composition and quality.

(*See also* 3697, 3729, 3786, 3787, 3837, 3847, 3904, 4203, 5593.)

3996. Davenport, J. B.
Natural coating of apples. V. Unsaturated and minor saturated acids of the cuticle oil.
Aust. J. Chem., 1960, **13**: 411-15, bibl. 14, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-242.

Fatty acids, mainly linoleic and oleic, comprised 48·5% of the cuticle oil of ripe Granny Smiths.

3997. Tosco, U., and Trombi Giarrusso, O.
La resistenza delle mele al *Penicillium expansum* e possibili relazioni con la presenza di antociani nella epidermide dei frutti. (**The resistance of apples to *Penicillium expansum* and its possible connection with the presence of anthocyanins in the epidermis of the fruits.**) [English summary ¼ p.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 462-73, bibl. 19, illus.

Among the 68 apple varieties tested, resistance to *Penicillium expansum* was generally highest in those with russet skins, followed by those with red skins. Yellow skins were more susceptible, and the lowest resistance was found in striated and green skins. In apples with both red and yellow areas the red part was the more resistant in all 14 varieties tested.

3998. Wilkinson, B. G., and Perring, M. A.
Variation in mineral composition of Cox's Orange Pippin apples.
J. Sci. Food Agric., 1961, **12**: 74-80, bibl. 10.

The amounts per unit weight of N, P, K, Mg, Ca and Na in individual apples from a single tree varied by a factor of 2. Replicate random samples of 25 apples from one tree should (19 times out of 20) give means within ±6% of the true mean for N, P, K and Mg. The amounts per unit weight of P, K, Mg and Ca in different regions of an apple varied several fold, the gradient being from the outer cortex to the core. The proportionality previously reported between K and Mg from different manurial treatments and at different seasons [*H.A.*, 28: 1131] applied also to single apples and to portions of an apple. A highly significant correlation was found between the Mg and P contents in portions of individual apples and also between apples; this correlation was not found between seasons or between manurial treatments. [From authors' abstract.]—Ditton Lab., Larkfield, Maidstone, Kent.

3999. Kenworthy, A. L., and Harris, N.
Organic acids in apples as related to variety and source.
Food Technol., 1960, **14**: 372-5, bibl. 11, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-35.

Samples of McIntosh, Red Delicious and Golden Delicious from Michigan and Golden Delicious from Washington were used. The total acidity was highest in Golden Delicious from Michigan and lowest in Golden Delicious from Washington. The individual acids found in each sample are given.

4000. Gorrod, A. R. N.
Sorbitol metabolism in apple fruits.
Nature, 1961, **190**: 190, bibl. 1.

Sucrose was formed when an aqueous extract of an acetone powder preparation from the fruit cortex of apples was treated with sorbitol in the presence of boiled yeast extract.—E. Malling Res. Stat., Kent.

4001. Jennings, W. G., Leonard, S., and Pangborn, R. M.
Volatiles contributing to the flavour of Bartlett pears.
Food Technol., 1960, **14**: 587-90, bibl. 21, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-191.

Aqueous essences with a desirable aroma of Bartlett pears were obtained by processing fresh ripe pears in a specially designed closed system. Of 32 fractions obtained by chromatography 5 contributed to the desirable aroma and 4 possessed undesirable aromas. Copper or copper alloys caused flavour degradation.

Harvesting, handling and marketing.

(*See also* 3727, 3730-3733, 3806-3808, 3828, 3972, 4033, 5584.)

4002. Nicholas, J. L., and Baumgart, M. G.
Suitable bulk harvesting equipment for three sizes of orchards.
N.Z. J. Agric., 1961, **102**: 65-73, illus.

A discussion on capital investment and justifiable expenditure, bin sizes and construction, and the most satisfactory systems of bulk harvesting for orchards producing 8,000 bushels, 16,000–24,000 bushels and over 24,000 bushels per year.

4003. Stollsteimer, J. F.
Bulk containers for deciduous fruits: costs and efficiency in local assembly operations.
Res. Rep. Calif. agric. Exp. Stat. **237**, 1960, pp. 52, bibl. 3, illus.

In these studies 4 methods of handling bulk bins (each containing 925–1,150 lb. of fruit) and 5 methods of handling lugs (each containing 42 lb.) were compared. The efficiency of a given method was found to depend on the output rate and the hauling distance. For transporting up to 250 lugs per hour over a distance of 1 mile, handling in lugs on trailers was the cheapest method, but for a distance of 10 miles bin handling methods were cheapest at all output rates greater than 50 lugs per hour. When both container and handling costs were considered all bin methods were cheaper than lug methods at all rates of output and for all distances, because the bins themselves cost 45% less than the lugs for the same volume of fruit handled.

4004. O'Brien, M.
Designs for bulk fruit bins.
Circ. Calif. agric. Exp. Stat. **490**, 1960, pp. 12, illus.

On the basis of harvesting experience during 3 seasons, directions are given for the construction of the most satisfactory type of bin.

4005. Lötter, J. de V.
Mechanical handling of fruit.
Dec. Fruit Gr, 1961, **11**: 16-31, bibl. 50, illus.; 37-57, bibl. 104, illus.; 77-81, 89, 93, bibl. 20, illus.

A detailed review is given of trials, mostly in America, with mechanical aids to picking, collecting and transporting olives, nuts, citrus, cherries, prunes, grapes, blueberries, pears, peaches and figs. The apparatus used is described and illustrated. The second part deals with pallet handling, 7 different methods of bulk handling, methods of emptying the bins, factors influencing the choice of a bulk handling system, bin construction, cooling of fruit in bins, the effect, and factors influencing the effect, of bulk harvesting on fruit quality, and the economic effect of bulk harvesting on fruit handling. The third part deals with packing and transport.

4006. Ricks, D. J., and Wheeler, R. G.
Farm management aspects of mechanical harvesting and handling of tree fruits in Michigan.
Quart. Bull. Mich. agric. Exp. Stat., 1961, **43**: 606-17, bibl. 5.

Mechanical harvesting of sour cherries and other suitable fruits will result in a higher income, providing the average yield is at least 4 tons/acre. Tree shakers and catching devices may be used for harvesting plums, cling peaches and possibly sweet cherries to be sold for canning, as well as for the sour cherries. Less bruising occurs when apples and pears are handled in bulk boxes. Costs of mechanical and hand harvesting on various acreages are compared for 3 different yield levels.

4007. Anon.
Machines to harvest cherries and plums.
Agric. Res., Wash., 1961, **9**(7): 8-9, illus.

A tractor-mounted, hydraulically activated shaker, equipped with a claw boom, removed 95% of sour cherries from the tree, the remaining fruit being undersized and unripe. The fruit was caught on a folding canvas catching frame and transported from orchard to cannery in water. Mechanical harvesting enabled 7 men to do the work of 33 hand-pickers and reduced costs by a half. Stanley Prune plums were also harvested by this method at an average rate of over 10 trees (51 bushels) per hour. The quality of machine-picked plums compared favourably with that of hand-picked fruit.—U.S.D.A., and Mich. agric. Exp. Stat., E. Lansing.

4008. Whittenberger, R. T., and Hills, C. H.
Bruising of red cherries in relation to the method of harvest.
[*Rep.*] *U.S. Dep. Agric.* **ARS 73-27**, 1960, pp. 14, bibl. 14, illus.

Compared with hand-picking into a pail, bruising was considerably reduced and the rate of harvesting slightly increased when the cherries were picked with the finger tips and dropped onto a self-draining minnow net. The rate of harvesting was increased 4-fold, but without any reduction in bruising, when the fruits were manually shaken off the tree into the net. When shake-harvested cherries were placed in cold water immediately, scald did not develop over a 24-hour period, but a delay of 2–5 hours before cooling resulted in appreciable scald.

4009. Goosen, N. C.
The effect of picking stage on the quality of peaches.
Dec. Fruit Gr, 1961, **11**: 9-11, illus.

The use of the Ballauf pressure tester is described and illustrated. For local or overseas marketing of all varieties in S. Africa, except Babcock, the ideal picking pressure is from 12 to 15 lb., with 20 and 8 lb. as the limits. For distribution within the continent of Africa, which necessitates more than 5 days on the railway, pressures between 18 lb. and 26 lb. are recommended for common varieties.—W. Prov. Fruit Res. Stat., Stellenbosch.

4010. Kattan, A. A., Morris, J. R., and Rom, R. C.
Factors affecting quality of canned and frozen peaches.
Arkans. Fm Res., 1960, 9(6): 4.

Peaches of the Redhaven and Elberta varieties harvested at the hard, firm and firm-ripe stages of maturity were processed after 0, 2, 4 or 6 days of ripening at 70° F., and the effects on colour and flavour were noted. Processing or freezing fruit at the hard and firm stages gave a poor result, but with ripening at 70° F. the flavour and colour improved to equal that of fruit harvested at the firm-ripe stage. [See also *H.A.*, 30: 4939.]

4011. POWELL, J. V.
Appalachian apples: packing costs and efficiency.
Mktg Res. Rep. U.S. Dep. Agric. **435**, 1960, pp. 20, bibl. 2, illus.

The data analysed in this report showed that increased mechanization reduced labour and equipment costs particularly in packing-houses with long packing seasons. Packing was quicker using a return-flow belt system instead of rotating tubs, and the packing rate was increased still further when semi-automatic, tray-packing machines were included in the system. Tray-pack cartons holding 44 lb. of apples were filled more quickly than Northwest boxes holding the same amount of fruit. Packers paid piece rates packed tray-pack cartons more speedily than those paid by the hour. [See also *H.A.*, 30: 3375.]

4012. PERKINS, F. A., AND BURT, S. W.
An improved work station for the manual sorting, sizing and packing of apples.
Misc. Publ. U.S. Dep. Agric. and Me agric. Exp. Stat. **641**, 1960, pp. 10, illus.

Constructional details are given of an apple packing house designed to incorporate principles of work simplification, and which was found to increase the speed of packing by 10%. The improved work station can be constructed from materials in existing packing stations.

4013. FORNEROD, W. P., AND VAN MUNSTER, P. J.
De eenmalige houten appelverpakking. **(The non-returnable wooden apple box.)**
Fruitteelt, 1961, **51**: 372-3, illus.

Three non-returnable wooden boxes were designed to hold 14–15 kg. apples. The two preferred are those holding two or three layers of size 70–75 mm. apples.—Proefst. Verpakkingen T.N.O.

4014. NYHLÉN, Å.
Transportförsök med äpple. Jämförelse mellan trälåda och wellpapplåda. **(Marketing studies with apples. A comparison between wooden boxes and corrugated fibre boxes.)** [English summary 1½ pp.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 133-44, bibl. 5, illus.

Fruit sent from southern Sweden to Stockholm showed heavier bruising in wooden boxes than in fibreboard cartons. Fibre sheets between the fruit layers gave better protection than other forms of padding tested. With fruits packed in polythene bags bruising was greater on fruits at the bottom of the carton than on those at the top. The times required for packing boxes with the different paddings, and the costs of the boxes, cartons and paddings are tabulated (in öre/kg. of apples).

4015. JACOBSEN, J. V.
Apple handling and storage.
J. Agric. S. Aust., 1960, **64**: 56-60, bibl. 1, illus.

Using fibreboard cartons instead of wooden cases during transport to the local market reduced bruising losses in apples. Fibreboard cartons, however, are more expensive, less moisture-resistant and cannot be stacked so high. To avoid ripe spot during the storage of Statesman, the fruit should be picked from the second week to the end of April, removed from the store early, preferably in September, and stored at the correct temperature. Jonathans, gas stored for 8½ months, were superior to those stored in air and in polythene case liners. Optimum eating maturity of the gas-stored fruit and of the fruit stored in lined cases was reached at 8 months, but the quality of air-stored fruit was very poor.

4016. PERKINS, F. A.
Discovers improved method of shipping poly-packed apples.
N.J. Agric., 1960, **42**(6): 3-5, illus.

Bruise-free Starr apples packed in polythene bags holding 4 lb. were shipped 130 miles in 2 types of carton. In one carton, which was divided vertically into 6 cells, 12 bags were placed vertically in a single tier. In the other carton the bags were laid horizontally in 2 tiers, the top layer being supported by a scored pad, and the centre bags being separated from the others by corrugated cardboard divisions. A considerable reduction in bruising was observed in the horizontal-type container. [See also *H.A.*, 31: 2038.]

4017. BLOOMFIELD, J. S.
Carton packs for Granny Smiths.
J. Agric. W. Aust., 1961, **2**: 265-71, illus.

Limited packing trials, using cell packs, are discussed, including a comparison between the tray carton and the Australian apple box. These trials have shown that Granny Smiths can be satisfactorily packed in cells.

4018. FOUNTAIN, J. B., AND CHAPOGAS, P. G.
Evaluation of shipping containers for Washington cherries.
Mktg Res. Rep. U.S. Dep. Agric. **426**, 1960, pp. 26, bibl. 1, illus.

Advantages of packing dessert cherries loose in 20-lb. boxes, instead of arranging them in a double-row faced pack in 15-lb. boxes, included savings in packing and car-loading materials, direct labour, supervision and freight charges. The loose-fill pack lends itself to assembly-line packing methods, which require less packing-house space than packing from individual bins. Packing the double-row faced pack cost 3·4 cents/lb. more than the loose pack, but the net return was about 4 cents/lb. greater with the faced pack. Both types of pack protected the cherries adequately during handling and shipping.

4019. Chapman, W. F., Jr., Pittman, J. F., and Carroll, A. B.
Costs, methods, and facilities in packing South Carolina peaches, 1959.
Mktg Res. Rep. U.S. Dep. Agric. **425**, 1960, pp. 32, illus.

A description of the packing operation includes the physical facilities, labour force and wage rates, types of container and operations performed in packing peaches. Labour requirements per container are discussed and packing costs analysed. Costs ranged from 90 cents per ¾-bushel tub basket in small packing-houses to $1·29 per 1-bushel tub basket in large packing-houses. In general, labour was less fully employed in the larger houses. Containers and their components accounted for about half the cost of packing. Costs of both container and labour were higher when 1-bushel tubs were used than when wire-bound crates of comparable size were used.

4020. Douglas, W. S.
Improvement in the grading and packing of fruit.
Dec. Fruit Gr, 1960, **10**: 365-9.

Practical advice to growers.

4021. Chapman, R. A., and Higgs, A. L.
Fruit sorting and sizing.
Tasm. J. Agric., 1960, **31**: 487-93, illus.

A discussion of the principles and practice of grading, with descriptions and illustrations of commercial equipment, for apples and pears.

4022. Anon.
The "Ansa" high-capacity grader. A revolutionary machine.
Orchard. N.Z., 1961, **34**: 84-5, illus.

The sizing mechanism in this apple grader separates the largest, relatively soft fruits first and the smallest fruits last.

4023. Kriel, P. E.
The handling and delivery of pears to the canning industry.
Dec. Fruit Gr, 1960, **10**: 363-4.

Advice on careful handling and grading.

4024. van de Plasse, J. B.
Wassen van appelen. (**Washing apples.**)
Fruitteelt, 1961, **51**: 399-400, illus.

Preliminary studies showed that after apples had been washed in water there was almost no fungal development during cold storage. After cold storage fruit appearance was improved by washing in a weak hypochlorite solution. A new Dutch machine for washing apples is described.—I.B.V.T., Wageningen.

Storage.

(*See also* 3728, 3731, 4015, 4024, 4065, 5568, 5584.)

4025. Pflug, I. J.
Oxygen reduction in CA storages: a comparison of water vs. caustic soda absorbers.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 455-66, bibl. 4.

The absorption of carbon dioxide from gas stores, using water as the absorbing medium, is practicable for the whole storage season including the oxygen reduction period. Tight gas stores completely filled with fruit require only 2 or 3 days longer to develop a 3% oxygen atmosphere with water absorbers than with caustic soda absorbers. Gas stores that are not completely air-tight or are only partially filled cannot be expected to operate satisfacorily when water absorption systems are used for carbon dioxide removal. [From author's summary.]

4026. Anon.
Risultati sulla conservazione delle mele e delle pere. (**Results of storage tests on apples and pears.**)
Inf. Ortofruttic., 1960, **1**: 198-201, illus.

A summary of results obtained by Ulrich at the cold storage station in Paris for Golden Delicious, Reinette de Canada, Stayman Winesap, Williams', Passe Crassane and Doyenné du Comice.

4027. Nesterov, Ja. S.
The keeping quality of the better apple varieties from the southern zone. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 33-4.

The loss in weight of apples of 31 varieties between picking and maturity was determined. Summer varieties lost 0·15–0·61% of their weight per day of storage, autumn varieties 0·05–0·23% per day and winter varieties 0·02–0·06% per day.

4028. Gorini, F. L.
Conservazione della Golden Delicious in sacchetti di polietilene in frigorifero. (**Cold storage of Golden Delicious apples in polythene bags.**)
Reprint from *Atti VIII Congr. naz. Freddo, Padova, 1959*, pp. 477-95, bibl. 33.

Details are reported from a comparison of cold storage of Golden Delicious apples in polythene bags 0·03 and 0·05 mm. thick, in cellophane bags 0·04 mm. thick, and in a crate lined with corrugated cardboard. The polythene bags completely prevented shrinkage of the pulp and wrinkling of the skins, and maintained until April or May all the qualities important for the market; they reduced, but did not prevent, *Gloeosporium* infection. On the whole, the thinner polythene was preferable. Cellophane was unsatisfactory, being too permeable to water vapour.

4029. JOHANSSON, J.
Plast för kommersiell kolsyrelagring av äpple. (**Plastic for commercial gas storage of apples.**) [English summary ½ p.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 93-102, bibl. 6, illus.

A polythene tent (100 gauge) was used successfully to cover stacked boxes of Ingrid Marie and Cox in a gas store. The gas concentration within the tent was 5·5% O_2 and 15·3% CO_2; the temperature in the store averaged 4·8° C., and that in the tent was rather higher. Fruit quality after storage under the tent was better than that of fruit stored in a conventional gas store.

4030. JACOBSEN, J. V., AND COWLEY, R. W.
Polythene case liners for pears—8 months storage possible.
J. Dep. Agric. S. Aust., 1961, **64**: 311-13, illus.

Practical advice on using bags of 0·0015-in. polythene, 32 × 36 in. in size, inside bushel cases.

4031. LAURENT, C., AND HERREGODS, M.
La conservation des poires. (**The storage of pears.**)
Rev. Agric., Brux., 1960, **13**: 1077-86, bibl. 2, illus.

The glucose, fructose and saccharose contents of Durondeau pears were estimated chromatographically at intervals during storage at 16° C., R.H. 80 to 90%, and at 5° C., R.H. 90–95%, and were found to follow a regular pattern during maturation. Pears harvested on 7 September and stored at 5° C., 3° C., and 1° C. showed internal browning in December, January and March, respectively. Browning occurred more rapidly with earlier harvesting. Artificial ripening at 5–16° C. for 3–7 days, followed by storage at 1° C., improved the taste and appearance of the pears. Storage in hermetically sealed polythene bags reduced internal browning. Comice and Conference pears matured normally during storage at 1–3° C., but storage in polythene bags delayed maturation. It is recommended that the variety Légipont should be stored at a low temperature as soon as possible after harvest.

4032. VAN DE PLASSE, J. B.
De Conference en de bruinverkleuring. (**Conference and internal browning.**)
Fruitteelt, 1961, **51**: 132-3, illus.

Internal browning has occurred in Conference pears in gas storage (with 4% CO_2), being most serious in fruit from trees on Quince A. The cause is considered to be CO_2 injury, possibly in combination with late picking.—I.B.V.T., Wageningen.

4033. TASMANIA DEP. AGRIC., HORTICULTURE AND PLANT PATHOLOGY DIVISIONS.
Harvesting of apples for market and storage.
Tasm. J. Agric., 1961, **32**: 46-50, illus.

Including notes on storage disorders and the influence of cultural conditions on them.

4034. MELVILLE, F., AND HARDISTY, S. E.
Bitter pit: a progress report on the use of calcium nitrate sprays for its control.
J. Agric. W. Aust., 1960, **1**: 1017-19.

Trials in 2 areas in south-western Australia included the following treatments of Cleopatra apple trees: (1) borax (1 lb./100 gal.) at full blossom; (2) calcium nitrate (16 lb./100 gal.), alone and with Triton (4 fl. oz./100 gal.) added, applied in 3 sprays on different dates between 15 November and 25 January; (3) borax (1 lb./100 gal.) plus calcium nitrate (16 lb./100 gal.) applied in 3 sprays at dates between 15 November and 11 January; and (4) unsprayed. Whilst fruit set was very erratic in 1 area, owing to late blossoming after an abnormally mild winter, tree pit plus storage pit was reduced to one-fifth in the second area when calcium nitrate sprays were applied. The sprays caused slight injury on some trees. It is recommended that at least 3 sprays, which should not exceed 10 lb./100 gal., be applied in mid-December and early and mid-late January.

4035. BAXTER, P.
Bitter pit of apples: effect of calcium sprays.
J. Agric. Vict., 1960, **58**: 801-11, bibl. 20, illus.

Trials in commercial orchards demonstrated that sprays of calcium compounds can reduce bitter pit in Cleopatra and Granny Smith. Calcium nitrate and calcium chloride were more effective than calcium acetate. To reduce pitting, visible at the time of picking, sprays should be applied 2–3 months before symptom appearance; to reduce pitting developing during storage, pre-harvest sprays were more effective. Covering the fruit during spraying did not reduce the effectiveness of the Ca sprays, but painting Ca salts on the fruit was more effective than foliar sprays. Management practices as they affect bitter pit are also briefly discussed.

4036. MARTIN, D., LEWIS, T. L., AND CERNY, J.
Bitter pit in the apple variety Cleopatra in Tasmania in relation to calcium and magnesium.
Aust. J. agric. Res., 1960, **11**: 742-9, bibl. 34.

When spray treatments were applied to half-trees of Cleopatra apples it was shown that magnesium nitrate increased the incidence of pit and calcium nitrate decreased it. There was a suggestion that borax decreased the effectiveness of the calcium nitrate treatment. Magnesium or calcium nitrate, with or without borax, did not affect the potassium, magnesium, phosphorus or nitrogen content of the fruit cortex. Calcium nitrate in 1959 increased the calcium content, but magnesium nitrate had no effect. There was no significant difference in the content of potassium, magnesium or phosphorus between 1958 and 1959, but the calcium content was 3·3 times as high in 1958. Pit incidence was low in 1958 and high in 1959. No significant difference in content of these four elements could be demonstrated between sound and pitted fruits. The results support the view that calcium is the critical element in pit incidence and that magnesium may play an important part. [Authors' summary.] —C.S.I.R.O., Hobart.

4037. Chittenden, E. T.
Investigations on bitter pit in apples.
A.R. Cawthron Inst., 1959-1960, 1960, pp. 25-6.

Foliar sprays of the acetates of Na, K, Ca and Mg, sodium borate and an iron chelate were applied to Cox's Orange Pippin apple trees. The Ca and Mg treatments slightly reduced the incidence of bitter pit, but K and Na treatments greatly increased pitting. Borax and the chelate very slightly increased pitting. Ground limestone at 4 tons/acre also increased pitting, but gypsum at 4 tons/acre had no effect. Fruits which were susceptible to bitter pit collapsed more readily during storage as a result of internal breakdown.

4038. Woodhead, C. E.
Bitter-pit investigations in 1960.
Orchard. N.Z., 1961, **34**: 9-13.

Bitter pit in Cox's Orange Pippin apples was materially reduced by delaying the harvest until a date set by the Marketing Board but it was still serious in the larger sized fruit. Incidence in Golden Delicious was low. There was no consistent evidence that locality influences the maturity of these varieties to an extent sufficient to affect the operation of a standard district harvest period. —Dep. Agric., Palmerston North.

4039. Nyhlén, Å., and Rootsi, N.
Några rön om pricksjuka. (**Some observations on bitter pit.** [English summary 2 pp.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 39-62, bibl. 10.

Cultural factors were found to affect the incidence of bitter pit in the following ways: During dry years more apples showed bitter pit from non-irrigated plots than from irrigated plots; in the manurial trials the lowest incidence occurred in plots with balanced N and P, with or without K; straw mulching appeared to favour bitter pit in comparison with clean cultivation. Figures did not confirm that fruit size was related to a tendency to develop bitter pit, nor that fruits from a tree bearing a heavy crop are more likely to develop bitter pit than those of a light crop. Analyses of healthy and damaged fruits showed that contents of K, P and Mg were lower in healthy fruits. Data also showed that the calyx end of fruits damaged by bitter pit had higher values for pH and for electro-conductivity, but a lower content of total acid.

4040. Burchill, R. T., and Edney, K. L.
The assessment of spore production by *Gloeosporium album* and its relation to fruit infection.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 90-3, bibl. 4.

Spores are dispersed throughout the year, with a maximum discharge in the autumn. Experiments on Cox's Orange Pippin apples showed that the incidence of rotting during storage was determined by the maturity of the fruit rather than by the quantity of inoculum to which they were exposed.

4041. Talvia, P.
Various species of *Gloeosporium* in stored apples in Finland. [Finnish summary ¼ p.]
Maataloust. Aikakausk., 1960, **32**: 239-46, bibl. 18, illus.

Gloeosporium perennans and *G. album* are the most important causal agents of apple rots in Finland. All the varieties tested were susceptible to *Gloeosporium*, although there were varietal differences in susceptibility to each of the 2 species. External factors, including dry weather in late summer, fungicidal sprays, and CO_2 during storage, decreased *Gloeosporium* rot in stored apples, as well as altering the relative proportions of infection by the two species.—Agric. Res. Centre, Tikkurila.

4042. Slotboom, H. J.
De bestrijding van het Gloeosporiumrot is geen probleem meer. (***Gloeosporium* control is no longer a problem.**)
Fruitteelt, 1961, **51**: 533-4, illus.

Captan sprays gave better control of *Gloeosporium* rot on Golden Delicious apples than AAteck, [a dithiocarbamate]. Halving the concentration and the spray interval did not affect the degree of control by captan.—R.T.C., Barendrecht.

4043. Edney, K. L., and others.
Effect of winter spraying on rotting of stored apples by *Gloeosporium* spp.
Plant Path., 1961, **10**: 10-13, bibl. 9.

A proprietary phenyl mercury spray containing 0·1% mercury was applied to Cox's Orange Pippin trees during the winters of 1957-58 and 1958-59. In the first season a single spray applied in February gave a significant degree of control. In 1958-59 different results were obtained in 2 separate trials, and in one instance control was obtained only when the February spray was augmented with an additional November spray. [From authors' summary.]—Ditton Lab., Larkfield, Kent.

4044. Schubert, O. E., and Stevens, L. P.
Control apple storage scald.
Curr. Rep. W. Va agric. Exp. Stat. **27**, 1961, pp. 7, illus.

Treatments tested on Red Rome and Stayman apples included: (1) spraying the apples on the tree with ethoxyquin (2 pt./100 gal.), (2) post-harvest treatment of apples from unsprayed trees by 15-sec. immersion in a tank of water containing ethoxyquin (2 pt./100 gal.), (3) wrapping fruit off the unsprayed trees in oiled paper wraps, and (4) mixing ½ lb. of shredded oiled paper with each bushel of apples. The fruit was examined after cold storage and again after 4–6 days at room temperature. All the treatments significantly reduced scald in the Rome variety, the best results being obtained with the dip treatment. Scald was not a problem on the Stayman apples and hence the results in this case were inconclusive.

4045. Padfield, C. A. S., and Smock, R. M.
Control of superficial scald on Granny Smith apples using pre-harvest sprays of diphenylamine.
N.Z. J. agric. Res., 1960, **3**: 675-9, bibl. 2.

Pre-harvest spraying of trees with 500–1,500 p.p.m. diphenylamine (DPA) in aqueous suspension, prepared either from a concentrated alcoholic solution or from a wettable powder, reduced subsequent development of superficial scald on Granny Smith apples in cool-store. Tree spraying was less effective than post-harvest treatment with DPA. [Authors' summary. For earlier work, see *H.A.*, 30: 1780.]—D.S.I.R., Havelock North, and Cornell Univ., Ithaca, N.Y.

4046. Jackson, D. I.
Cool storage of Hawke's Bay plums.
Orchard. N.Z., 1960, **33**: 335-7.

Santa Rosa, Sultan, Black Doris and Omega plum varieties were stored at 32° F. and 40° F. for 20 days. Samples of the stored fruit were examined on removal from storage and after a further 5 days at normal air temperatures. Santa Rosa could be stored for 20 days at 40° F. and kept well out of store if picked before fully ripe. Sultan stored only moderately well at either temperature, but flavour and appearance favoured storage at 32° F. Black Doris stored well at either temperature, but kept better after removal from storage at 32° F. than at 40° F. Omega kept well at both 32° F. and 40° F.; scald appeared on all fruit, but ripe fruit stored at 40° F. had good appearance and flavour.—D.S.I.R., Havelock North, N.Z.

SMALL FRUITS, VINES AND NUTS.

Strawberries.

(*See also* 3728, 3776, 3833, 3903, 3921, 4094, 4207, 4253, 4333, 4358, 4360, 5117, 5560, 5574, 5578, 5579, 5584.)

4047. Morgan, C. N.
Strawberry growing in Queensland.
Qd agric. J., 1960, **86**: 687-92, illus.

Varieties, land preparation, fertilization, establishment of crop, field management and harvesting discussed.

4048. Caselli, P.
La fragola coltura industriale. (**Commercial strawberry growing.**)
Inf. Ortofruttic., 1960, **1**: 145-7, illus.

Cultural practices, disease control, choice of varieties and packing in Italy.

4049. Topčijski, S.
On the value of some strawberry varieties as breeding material. [Bulgarian, with Russian and German summaries 1 p. each.]
Nauč. Tr. visš. Selskostop. Inst. G. Dimitrov, Sofia, 1960, **8**: 279-91, bibl. 3.

In a study of 5 strawberry varieties and their hybrids the earliest of all the hybrids produced was Surprise des Halles × Eva Macherauch, the berries of which are of regular shape with a smooth surface. Surprise des Halles can be successfully used for improving Mme Moutot. All hybrids of Mieze Schindler are late, with a dark red colour, red juice, a sweet and aromatic flavour and deeply placed seeds, but many of these hybrids are susceptible to leaf spot.

4050. Janick, J., and Marshall, G. E.
Yield-size relationship of strawberry varieties.
Fruit Var. hort. Dig., 1960, **15**: 29-32.

For each of 9 varieties the average berry weight at picking time was found from the number of berries per quart and the quart weight. The relationship between the weight and the number of berries per quart is non-linear and can be expressed by the formula $\log Y = 2{\cdot}737 - 0{\cdot}9117 \log X$, where Y is the number of berries per quart and X is the weight per berry in grams. By plotting berry size with picking time the time of peak picking can be obtained and compared for different varieties. In order to evaluate both size and yield directly the yield of large berries (100 or less berries per quart) was used. The use of 100 berries per quart is an arbitrary one.—Purdue Univ., Lafayette, Indiana.

4051. Thuesen, A.
Sortsforsøg med jordbær 1957-58. (**Strawberry variety trials 1957-58.**) [English summary 2½ pp.]
Tidsskr. Planteavl, 1960, **64**: 801-39, bibl. 22.

From 23 varieties observed in 4 areas, Senga Sengana gave the highest yields of good quality fruit.

4052. Craig, D. L.
Strawberry variety performance in Nova Scotia.
Fruit Var. hort. Dig., 1960, **15**: 25-6, illus.

Trials of 10 varieties during 1957 to 1959 showed the highest yielder to be Redcoat (16,683 lb. per acre), followed by Cavalier, Sparkle and Surecrop.

4053. Anon.
Midway strawberry is available.
Agric. Res., Wash., 1961, **9**(7): 15.
New strawberry variety.
West. Fruit Gr, 1960, **14**(12): 40.

This high-yielding, red-stele-resistant, virus-free strawberry, which produces many runners and is suitable for growing in matted rows on soils with a good moisture-holding capacity, is recommended as a replacement for Fairland and Temple. It ripens late and produces medium-large berries, which have a slightly acid flavour and which freeze well. It is susceptible to leaf scorch and leaf spot. —U.S.D.A., and Md agric. Exp. Stat.

4054. Thompson, P. A., and Guttridge, C. G.
The role of leaves as inhibitors of flower induction in strawberry.
Ann. Bot., Lond., 1960, **24**: 482-90, bibl. 10.

The effects of various defoliation treatments on flower initiation were studied in the variety Talisman, which is a facultative short-day plant, with particular reference to differences in the inductive capacity of leaves of differing maturity. Plants from which all mature leaves had been removed to leave only 2 immature leaves initiated flowers in longer photoperiods than intact controls, and, conversely, plants bearing only 3 fully mature and no immature leaves required a shorter photoperiod for flower initiation than intact plants. Intact plants in constant darkness and totally defoliated plants in continuous light both initiated flowers, but intact plants in continuous light failed to flower. These results indicate that the photoperiodic control of flowering operates through a flower inhibitor produced in the leaves. They also show that, although leaves of any maturity are able to inhibit flower initiation, under some conditions mature leaves are more inhibitory than immature, and that the inhibitory activity of any leaf decreases with decreasing photoperiod. [From authors' abstract. For earlier work see *H.A.*, 30: 312.] —Scot. hort. Res. Inst., Mylnefield, Invergowrie.

4055. Roodenburg, J. W. M.
Kunstlicht bij de voorjaarsteelt van aardbeien. (**Artificial light for the spring culture of strawberries.**) [English summary 21 lines.]
Meded. Dir. Tuinb., 1961, **24**: 24-6, 43, 61-2, bibl. 9, illus.

Boxed plants of Deutsch Evern in a heated glasshouse were given 8 hours of artificial light for 43 nights from mid-January. Incandescent lamps giving 20W/sq. m. were used, but the results indicated that light at 10W/sq. m. would have been sufficient. The final stages of winter dormancy were dispelled by this treatment, so that extension growth of the leaf and flower stalks was no longer inhibited.—Lab. Belichtingsonderz. Tuinb., Utrecht.

4056. Thompson, P. A.
The control of runnering in strawberries with maleic hydrazide.
J. hort. Sci., 1960, **35**: 249-59, bibl. 8.
The use of maleic hydrazide for the control of runners in strawberry plantations.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 7, bibl. 12.

Plants of the varieties Redgauntlet and Talisman growing in the field were sprayed with MH at 500, 1,000, 2,000 and 3,000 p.p.m. on 8 July. On 12 August a second spray at 1,000 p.p.m. was applied to some of the plants treated previously. Runners rooted before treatment were resistant to inhibition and reduced the effectiveness of the treatment on runners emerging later. Because of this a high level of control was achieved in Talisman only by spraying at 3,000 p.p.m. In Redgauntlet runners were adequately controlled at all levels except 1,000 p.p.m. as a single spray and 500 p.p.m. either as a single application or followed after a month by 1,000 p.p.m. Cropping in the following year was proportional to the degree of runner control achieved. All treated plants cropped better than controls, in which runners had been allowed to grow unchecked, and, at the higher levels, cropped as well as controls from which all runners had been removed by hand at intervals throughout the season. Treatment with maleic hydrazide in the glasshouse resulted in the formation of some branch crowns in place of runners. An increase in cropping of treated Royal Sovereign plants growing in the field was due to an increase in the number of branch crowns rather than to an increase in the number of inflorescences on each branch crown. [From author's summary. For earlier work, see *H.A.*, 30: 3418.]—Scot. hort. Res. Inst., Mylnefield.

4057. van der Kloes, L. J. J., and others.
Beworteling van aardbeien op zandgrond. (**Rooting of strawberries on sandy soil.**) [English summary ¼ p.]
Meded. Dir. Tuinb., 1961, **24**: 108-17, summary 142, bibl. 11, illus.

Studies with Jucunda showed that several soil factors were of importance for root development in strawberries, and that the usual description of a soil profile should be amplified by data on its structure, porosity and stratification. In 1959 a rooting zone at least 50 cm. deep was required to produce 80 kg. strawberries per are without irrigation. With irrigation a zone of this depth produced about 200 kg./are. Strawberry root systems are most likely to be upset by excess water, stratification of the soil profile and variations in profile structure. Methods of reducing the effects of these factors are discussed; drainage and subsoiling may sometimes be necessary.

4058. Webster, G. R.
The effect of sawdust, straw, compost and manure on the yield and chemical composition of strawberries and on soil moisture, acidity and organic matter content.
Canad. J. Plant Sci., 1961, **41**: 42-9, bibl. 19.

The materials were applied under dryland conditions to strawberry plantings at two locations, and the effects on yield, leaf nutrient content, soil moisture, soil acidity and soil organic matter content were evaluated. Sawdust mulch and sawdust incorporation, the former being slightly better, produced highly significant increases in yield over the control treatment and were superior to all other treatments. Soil moisture measurements showed that the sawdust treatments conserved soil moisture, and this was regarded as the chief reason for the increased yields. The N, P, K, Ca and Mg contents of leaves were somewhat affected by the treatments, but the levels were considered adequate in all cases. Soil acidity was significantly increased in the sawdust plots, but this was attributed to the additional nitrogen applied rather than to the sawdust *per se*. Sawdust incorporation, manure and compost treatments significantly increased soil organic matter contents when compared with the control. [From author's abstract.]—Canada Dep. Agric., Saanichton, B.C.

4059. Bakkendrup-Hansen, G.
Forsøg med kemisk bekæmpelse af ukrudt i jordbær. **(Experiments on chemical weed control in strawberries.)** [English summary ½ p.]
Tidsskr. Planteavl, 1960, **64**: 840-6.

Neither propham nor 2,4-DES are considered suitable for controlling weeds in strawberries. Although weed populations were reduced, fruit yields were also reduced when these herbicides were applied separately at 5 or 10 kg. active ingredient per acre, or together at 2·5 kg. a.i. of each compound per acre.—Stat. Ukrudtsfors., Lyngby.

4060. Hemphill, D. D.
Weed control in established strawberry plantings.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, p. 45.

Autumn-germinating broadleaved weeds were controlled satisfactorily with late autumn (early November) applications of 2,4-D, and grasses by dinitros or chlorpropham applied when the strawberries were dormant. Weeds introduced from viable seeds in cereal straw mulches were controlled by chlorpropham at 2 lb./acre applied on top of the mulch in late winter while the strawberries were still dormant. Strawberry varieties differed considerably in their sensitivity to granular herbicides applied after mulch removal in the spring.—Mo. agric. Exp. Stat., Columbia.—From *Weed Abstr.*, **9**, No. 1939.

4061. van Staalduine, D.
The use of simazine in strawberries.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5, bibl. 8.

The results are presented of 4 years' trials on the use of simazine for weed control in strawberries, infested mainly with *Poa annua*, *Senecio vulgaris* and *Stellaria media*. Post-harvest applications of 0·5–0·75 kg. of simazine in 1,000 l./ha. on various types of sandy clay soil caused no yield depression during the following season. Applications of 0·25–0·75 kg./ha. made in early spring caused some damage, the extent of which depended on variety, soil type and amount of rainfall. In runner beds a rate of 0·5 kg./ha. applied to 4 varieties at the time of runner formation in June-July did not affect the production of young plants. There was evidence that simazine applied in October-November would keep the rows substantially clear of weeds until picking time in the following season.—I.B.S. Weed Control Dep., Wageningen.—From *Weed Abstr.*, **10**, No. 72.

4062. Holm, L., Gilbert, F., and Haltvick, E.
The response of strawberries and weeds to the triazine herbicides.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, pp. 44-5.

From results of trials conducted with the strawberry variety Sparkle on a sandy loam it is concluded that simazine, applied at low rates, and atrazine, Karsil and amiben, applied in mid-August, are all promising.—Univ. Wis., Madison.—From *Weed Abstr.*, **9**, No. 1940.

4063. Mitchell, F. G., and others.
Rapid handling and cooling to improve strawberry marketability after arrival in eastern markets.
Calif. Agric., 1961, **15**(2): 13-14.

The percentage of marketable fruits on arrival at eastern markets was higher in strawberries cooled to 40° F. within approximately 2 hours from harvest than in fruits which were cooled within 8 to 14 hours from harvest. Refrigerated storage at the market also slowed down deterioration.—Univ. Calif., Davis.

4064. Thompson, B. D.
Chemical treatments of fresh vegetables to reduce decay losses during marketing.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 176-8, illus.

Sodium dehydroacetate at 0·6 to 0·8% as a 30-

second dip has been the most effective chemical treatment for the control of post-harvest decay of strawberries, and is now approved. Gamma irradiation at safe dosages was not as effective as the dehydroacetate treatment, and at higher dosages it damaged the strawberries. Oxytetracycline dips and higher dosages of γ-rays controlled black spotting of radishes, but neither treatment is approved. [For earlier results see *H.A.*, 30: 3728.]

4065. BJURMAN, B.
Försök med djupfrysning av jordgubbar, hallon och körsbär. (**Studies on deep-freezing with strawberries, raspberries and cherries.**) [English summary ¼ p.]
Sver. pomol. Fören. Årsskr. 1960, 1961, **61**: 145-53, bibl. 7.

After 6–9 months in the deep-freeze varietal evaluation showed that Senga Sengana, Senga 54 and Senga 752 were the best strawberries for freezing, and that Mitra was the best raspberry. All the black cherry varieties tested could be recommended, while Heinrichs Reisen was the best of the white varieties.

4066. DENNIS, C. C.
Strawberry prices and marketing margins.
Quart. Bull. Mich. agric. Exp. Stat., 1961, **43**: 648-59.

An economic study covering returns for fresh and processing fruit in Michigan as compared with California and the U.S. as a whole.

Other small fruits.

(*See also* 3621, 3635, 3659, 3689, 3726, 3729, 3752, 3766, 3837, 3893, 3896, 3903, 3908, 3909, 3977, 4005, 4065, 4333, 5560, 5574.)

4067. (VAN CLEAVE, M., AND RASMUSSEN, D.)
Mechanical picker for blackberries.
West. Fruit Gr, 1961, **15**(2): 51, illus.

A prototype machine is described which straddles a row of blackberries. Two steel drums, one on each side of the row, are fitted with rubber bumper bars. These bars shake the canes as the machine moves along, causing ripe berries to fall onto conveyor belts. With a crew of 3–4 men the picker can harvest ½ acre per hour.

4068. HUMBLE, T.
10 years' experience of the high bush blueberry.
Gdnrs' Chron., 1960, **148**: 273.

By an amateur grower in Surrey.

4069. DARROW, G. M., WHITTON, L., AND SCOTT, D. H.
The Ashworth blueberry as a parent in breeding for hardiness and earliness.
Fruit Var. hort. Dig., 1960. **14**: 43-6.

4070. OBERLE, G. D., MOORE, R. C., AND HARDIGREE, J. B.
An unusual winter injury effect in high bush blueberries.
Fruit Var. hort. Dig., 1960, **15**: 13-14.

In 1951 and 1959 failure of leaf development was observed on blueberries although blossoming and cropping was heavy. Weather records suggest that autumn frosts damaged leaf buds, but not flower buds, which perhaps become fully dormant earlier. —Va agric. Exp. Stat., Blacksburg.

4071. AMLING, H. J.
Influence of nutrient-element supply on leaf composition and growth of highbush blueberry (*Vaccinium corymbosum* L.) with special reference to importance of sampling date on leaf and fruit composition of field grown blueberries.
Diss. Abstr., 1960, **21**: 1012, being *L.C. Card No. Mic.* 60-3397 of 195 pp.

In sand culture the leaf contents of N, P, K, Mg, Ca, B and Mn increased as the level of the relevant element in the nutrient solution increased. Iron and Cu in the leaf increased only when there was a high external content of the nutrient. In vermiculite K and B increased as the supply of the nutrient increased; contents of Mn, Fe and Cu increased only when solutions containing high levels of the nutrients were used. The following nutrient interrelationships were observed: (1) with an increasing supply of N leaf contents of all other elements except P decreased; (2) a deficiency or excess of P decreased leaf contents of N; (3) as K levels increased from 0 to 30 p.p.m., and Mg levels increased from 0 to 24 p.p.m., the antagonistic effects of one nutrient upon the other were similar, but with a further increase in concentrations the effect of Mg on K uptake became the more severe; (4) Fe strongly affected Mn uptake, but there was no reciprocal effect; (5) a low level of any macro-nutrient resulted in high leaf contents of Mn; (6) a low Ca level in the nutrient solution promoted the accumulation of the heavy metals and Mg and K in the leaf; (7) leaf contents of K decreased with increased nutrient levels of B. Leaf pigmentations characteristic of N, P and Mg deficiencies appeared sooner and were more conspicuous with high levels of solar radiation. At low rates of solar radiation the symptoms faded or, in the case of Mg deficiency, developed different characteristics. There appeared to be an increased requirement for most major nutrient elements, except K, as the amount of solar radiation increased; there was an increased demand for K as solar radiation decreased. Low levels of N in the nutrient solution stimulated root growth, whereas high N, B, Mn, Fe and Zn, and low Ca, B and Mn reduced root development. The high P treatment produced the most desirable root system. The plants grew well in agricultural vermiculite when supplied with N and P, but growth was noticeably reduced when K or Fe was given. Seasonal trends were observed for all nutrients except B; leaf contents of N, K, P and Cu decreased, whereas those of Mg, Ca, Fe, Mn and Zn increased as the season progressed. Fortnightly leaf sampling showed that the greatest consistency in leaf contents of all nutrient elements occurred in a 3-week period before and including the first week in which 35% of the crop could be harvested. Leaf contents of Mn were higher in Jersey than in Rubel plants. Rubel appeared to have a higher Mg requirement than Jersey. Rubel fruit contained higher amounts of N and K, and lower amounts of Ca and Mn than did Jersey fruit. Rubel fruit had a poorer keeping quality than Jersey, when N and K were higher and Ca was lower than the average. All nutrient elements in the fruit declined with increasing maturity.—Mich. St. Univ.

4072. Bowers, R. C., and Dewey, D. H.
Further studies of the relation of sugar-acid ratios to the ripening and deterioration of Jersey and Rubel blueberry fruit.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 303-11, bibl. 4.

Ripening as indicated by changes in the sugar and acid contents was rapid for the first 4 days after the skins started to redden in both varieties, and full ripeness was reached 8–12 days after the start of reddening, when the sugar content was at its maximum and the acid content at its minimum. Rubel berries had higher total sugar and titratable acid contents than Jersey berries at comparable stages of ripeness. Breakdown of fruit held at 75° F. for 6 days or at 40° F. for 18 days was significantly correlated in a linear and positive manner to the sugar : acid, soluble solids : H-ion concentration, and estimated sugar : estimated acid ratios of the fruit.

4073. Baker, E. R.
Cranberry production in the Pacific northwest.
Soil Conserv., 1960, **26**: 54-6, illus.

The clearing and drainage of the bog, installation and uses of a sprinkler irrigation system, preparations for planting, harvesting and marketing are discussed.

4074. Dana, M. N.
Simazine for annual weed control in cranberries.
Weeds, 1960, **8**: 609-11, bibl. 4.

Granular simazine was tested over 2 years. At 8 lb./acre it caused severe foliage injury, with up to 40% reduction in crop yields. A rate of 4 lb./acre produced foliage injury ranging from slight to severe, the degree being correlated with soil texture; 1 and 2 lb./acre caused no injury. Control of *Ambrosia artemisiifolia*, *Bidens connata*, *Panicum* spp. and *Polygonum pennsylvanicum* was excellent at all rates of simazine, and 1 and 2 lb./acre used on very weedy plots resulted in increased crop yields.—Univ. Wis., Madison.—*Weed Abstr.*, **10**, No. 263.

4075. Nilsson, F.
I poliploidi nella genetica del *Ribes*. **(Polyploids in the genetics of *Ribes*.)**
Genet. agrar., March, 1960, repr. in *Inf. Ortofruttic.*, 1960, **1**: 167.

Autotetraploids have been produced in *Ribes nigrum*, *R. rubrum*, *R. alpinum*, *R. grossularia* and *R. oxyacanthoides*, the first named being the most fertile. Of the various interspecific hybrids so far produced, the 3 fertile ones are classified as new amphidiploid species. These are: *R. nigrolaria* (*R. nigrum* × *R. grossularia*), *R. nigroniveum* (*R. nigrum* × *R. niveum*) and *R. satigrum* (*R. sativum* × *R. nigrum*).

4076. Beecham Foods Ltd.
A guide to the growing of blackcurrants.
Beecham Foods Ltd., London, 1960, pp. 59, illus., 5s.

This booklet has been prepared primarily for contract growers who produce black currants for the fruit juice industry, but anyone who grows black currants will find it of great interest. All aspects of growing are dealt with, including cost of establishment, choice of site, varieties, pruning, manuring, harvesting and control of pests, diseases and weeds.

4077. Neumann, U.
Feldversuche mit Schwarzen Johannisbeeren. (2. Mitteilung.) **(Field trials with black currants. II.)** [English and Russian summaries ½ p. each.]
Arch. Gartenb., 1960, **8**: 538-58, bibl. 50.

With sufficient phosphoric acid an increase in N from 0 to 100 kg./ha. resulted in the 3rd cropping year in an increased yield of 25%, but further N increases were without effect. Corrective pruning reduced the individual bush yield by 30–40% except in the 4th to the 5th cropping year when yields were higher. Fruit drop and berry weight were not affected by pruning, whereas picking performance was increased from 3·9 to 5·6 kg. per man-hour. Daniels September and Westwick Triumph gave consistently higher yields than Rosenthals Schwartze, Silvergieters Schwartze and Goliath. Varietal differences in resistance to frost damage were determined. Frost damage to the wood, except in the case of Daniels September, depended on the yield of the previous year. [For earlier work, see *H.A.*, 26: 3412.]—Inst. Acker- u. Pflanzenb., Univ. Rostock.

4078. Bobryševa, A. M., and Oknina, E. Z.
Transformation of reserve substances in the flower buds of black currant during its annual cycle. [Russian, with English summary 6 lines.]
Fiziol. Rast., 1960, **7**: 591-4, bibl. 15, illus.

A close relation has been found to exist between tannin-lipoid substances and protoplasm proteins. A long-lived stable condition of complex protein-lipoid compounds has been established. Starch was found to appear when these compounds began to disintegrate during emergence of the tissues from the dormant state. This profound transformation of reserve nutrients during the dormant state in black currant characterizes it as a cold-resistant plant. [Authors' English summary.]

4079. Hoyle, D. A.
Some effects of temperature and day-length on the breaking of winter dormancy in black currant.
J. hort. Sci., 1960, **35**: 229-38, bibl. 6.

The effects of different periods of chilling, given either as natural cold weather or in a cold room at 38° F., cutting back, and subsequent day-length and temperature treatment on bud-break in black currant, variety Boskoop Giant, have been investigated. It was found that increasing amounts of cold treatment up to 15 weeks at 38° F. progressively decreased the length of time to bud-break in short days. With inadequate chilling and short days, bud-break was delayed or even prevented and the percentage bud-break was much reduced. Plants broke dormancy more quickly in long than in short days when chilling was inadequate. Long days were shown to replace chilling. The percentage number of lateral buds breaking was greater in long than in short days for each chilling treatment. Buds on cut-back shoots in general broke more quickly than buds on entire shoots, the differences increasing with decrease in chilling. In general, low temperature following the chilling period delayed bud-break and high temperature accelerated it. There was also an interaction with day-length. [Author's summary.]—Univ. Reading.

4080. van Lier, P. J.
Nachtvorstbestrijdingsproeven gaven in 1960 hoopgevende resultaten voor kleine percelen. (**Trials on controlling night frost have given promising results in 1960 on small plots.**)
Fruitteelt, 1961, **51**: 242-3.

Several methods were tried for protecting black currant bushes in small areas from spring frosts, and the most successful method was to tie up the bushes and cover them with a paper sack, 3 layers thick [see also *H.A.*, 31: 2117]. Jute sacks were almost as effective as paper sacks but are more expensive. Polythene sacks were not effective but it is suggested that PVC may be a better material. —R.T.C., Roermond.

4081. Zaharov, G. A.
Bees in the pollination of black currants and gooseberries. [Russian.]
Pchelovodstvo, 1958, **35**(5): 29-33, from abstr. in *Bee World*, 1960, **41**: 138.

The percentage of ripe berries, their weight and the number of seeds per berry were greater on an average when bees were working during the flowering period. Those varieties which had more sugar in the nectar were visited by more bees. Currant bushes which were adjacent to gooseberries were also visited better, and their crop was 20–50% higher. It is suggested that currants and gooseberries should be planted in adjacent rows.

4082. Zaharov, G. A.
The role of supplementary pollination with foreign pollen in increasing yields of black currants. [Russian.]
Agrobiologija, 1960, No. 3, pp. 461-2.

In trials with 3 varieties over 3 years open pollination gave the highest percentage of fruit set and the largest berry weight and number of seeds per berry. Artificial or natural self-pollination gave poor yields, which were surpassed by artificial supplementary pollination with gooseberry or cherry pollen or with pollen from other varieties of black currant.

4083. Bodi, I., and Chița, D.
Înmulțirea rapidă a coacăzului. (**The rapid propagation of red currants.**) [English, French, German and Russian summaries $\frac{1}{2}$ p. each.]
Grăd. Via Liv., 1960, **9**(11): 36-8 + summaries.

Versailles Red gave more cuttings than Holland Red: on the former more wood suitable for cuttings was produced as a result of severe pruning; on the latter as a result of ring pruning. The optimum period for taking cuttings was 1–10 October. Softwood cuttings and layers rooted poorly.—Voinești Fruit Exp. Stat.

4084. Schalk, A.
Hagen en spillen bij rode bessen. (**Hedge and spindle training for red currants.**)
Fruitteelt, 1961, **51**: 136-7, illus.

Directions for these new forms of training.

4085. Skalská, E.
Nejvhodnější kombinace průmyslových hnojiv pro červený rybíz se zřetelem na jeho výnos. (**The most favourable combinations of mineral fertilizers for red currants with regard to yield.**) [Russian and German summaries $\frac{1}{3}$ p. each.]
Rostlinná Výroba, 1960, **6**: 1205-22, bibl. 22, illus.

In field trials on soils of pH 7·06 the application of superphosphate, K_2SO_4 and $(NH_4)_2SO_4$ increased yields by 13–52%. In pot experiments the influence of fertilizers containing chlorine on the incidence of a deficiency disease affecting the leaf margins was established, and it is recommended that K_2SO_4 be used in place of KCl.

4086. Davídek, J.
Isolation of chromatographically pure rutin from flowers of elder.
Nature, 1961, **189**: 487-8, bibl. 9.

The method is described. Dried elder flowers contain up to 3% of rutin, of which 90% can be recovered.—Cent. Res. Inst. Food Ind., Prague.

4087. Tóth, E., and Tóth, E. (Mrs.)
Kasztrálási és szigetelési kísérletek köszmétevirágon. (**Trials on the emasculation and isolation of gooseberry flowers.**) [Russian and German summaries ⅓ p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 161-8, bibl. 8, illus.

In breeding material the isolation of flowers was found to be essential, and emasculation had to be carried out before anthesis.

4088. Teterev, F. K.
The new gooseberry variety Urožajnyj [Fruitful]. [Russian.]
Agrobiologija, 1960, No. 4, pp. 522-9, illus.

This new vegetative hybrid, when propagated vegetatively, did not always give rise to plants with the same morphological form. Cuttings from shoots from the bottom of the bush produced trailing plants, whereas cuttings from higher on the bush produced upright plants. Grafting new varieties of gooseberry onto the black or golden currant induced much coarser, more vigorous growth.

4089. Mel'nikova, V. A.
Preliminary data on top- and soft-fruit variety trials. [Russian.]
Sadovodstvo, 1960, No. 12, pp. 12-13.

Ninety-two varieties of top and soft fruit plants were studied in the Baškir A.S.S.R., and 7 varieties of apple are recommended as being particularly winter hardy. Descriptions are given of 3 new winter hardy, high yielding varieties of gooseberry, the best one giving an average annual yield of about 43 centners/ha. over a 4-year period starting 2 years after planting. High yielding, winter hardy black currant varieties are also described which produced 27 centners/ha. of fruit with an average weight of 1·06 g. per currant.

4090. Ricketson, C. L., Goble, H. W., and Kelly, C. B.
Raspberries and blackberries in Ontario.
Publ. Ont. Dep. Agric. **473**, revised 1960, pp. 43, illus.

Culture, pests and diseases are covered.

4091. Loginyčeva, A. G.
Results of variety trials of raspberries in the Kirovsk region. [Russian.]
Sadovodstvo, 1960, No. 12, pp. 14-16.

Winter hardiness, yield and fruit quality were evaluated for 11 varieties. Results from 8 seasons' trials showed Latham and Malborough to be the most winter hardy and among the highest yielding of the varieties tested. One of the best varieties, Spirina Seedling No. 14, could not be recommended as it was particularly susceptible to virus disease. Phenological data on all the varieties are recorded.

4092. Robinson, D. W.
Experiments with dalapon in soft fruit crops.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 7, bibl. 23.

From the results of experiments described it is concluded that dalapon effectively controls grasses in soft fruits, but in raspberries it can be used safely only at 3·7 lb./acre applied between mid-November and mid-January. In black currants and gooseberries a greater latitude in both rate and timing seems possible. [For earlier work, see *H.A.*, 30: 3649.]—Hort. Res. Cent., Loughgall, N. Ireland.—From *Weed Abstr.*, **10**, No. 73.

4093. Robinson, D. W.
Experiments with simazine and other herbicides in soft fruit crops.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 7, bibl. 6.

Results are given of several experiments, from which it is concluded that simazine at 2 lb./acre provides excellent control of germinating weeds and is safe to use in established raspberries. In preliminary trials with black currants and gooseberries simazine and atrazine gave very promising results. —Hort. Res. Cent., Loughgall, N. Ireland.—From *Weed Abstr.*, **10**, No. 74.

4094. Sutherland, J. P.
Further preliminary trials of chemical weedkillers in raspberries and strawberries.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5, bibl. 1.

Of 8 herbicides applied on 11 April to raspberries planted in late March, atrazine at 2 and 4 lb./acre and simazine at 6 lb./acre gave very good weed control in late spring without causing crop injury, and the plots treated with simazine remained free of weeds during the whole summer. Of 5 treatments applied to control *Agropyron repens* in raspberries dalapon at 8·5 lb./acre gave the best results. Soil surface sprays of simazine, atrazine and 3 other herbicides killed strawberries planted 2 days later.—Scot. hort. Res. Inst., Mylnefield. —From *Weed Abstr.*, **10**, No. 75.

4095. Wood, C. A., Sutherland, J. P., and Stephens, R. J.
Effects of the use of herbicides on the growth, cropping and weed flora of raspberry plantations: a progress report.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 7, bibl. 1.

Two experiments are reported. In the first, which was in its 3rd year, TCA at 18·6 lb./acre + dinoseb at 2·8 lb./acre injured young raspberry stems and depressed fruit and new cane production. In the second experiment simazine at 2·5 lb./acre, applied over 2 consecutive years, gave very good weed control and increased yields.—Scot. hort. Res. Inst., Mylnefield.—From *Weed Abstr.*, **10**, No. 76.

4096. Sutherland, J. P., and Stephens, R. J.
Effects of some chemical weedkillers on a raspberry cane nursery: a progress report.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5, bibl. 2.

Simazine, monuron and 2,4-DES + propham were applied in 1958, 1959 and 1960 to raspberries planted in 1958. The growth and quality of canes harvested in the winter of 1959/60 was best on plots receiving simazine at 2 or 3 lb./acre, and this treatment also eliminated the need for hand cultivation. Monuron at 3 lb./acre also produced a good crop of canes and substantially reduced the need for cultivation. At 5 months after applications there were no seriously phytotoxic levels of residue in the top inch of soil.—Scot. hort. Res. Inst., Mylnefield.—From *Weed Abstr.*, **10**, No. 77.

Vines—general.

(*See also* 3616, 3785, 3824.)

4097. Weaver, R. J.
Grape growing in Greece.
Econ. Bot., 1960, **14**: 207-24, bibl. 14, illus.

Vineyards are usually planted at 1,000–2,000 vines/acre. In phylloxera-free areas planting is often irregular, the rows disappearing as old vines die out and layers are grafted *in situ*, thus making mechanical cultivation impossible. Vines are often cut back to ground level, so that the new growth makes a head which is usually unsupported and covers the ground between the vines. Protective arbors are erected for table varieties. Pruning practices for the various varieties and girdling procedures are described. The use of 4-chlorophenoxyacetic acid is gradually replacing girdling for improving fruit set. Several methods of cultivation are described, which concentrate rain water at the base of the vine. Varieties, harvesting methods and drying are described.

4098. Vitolović, V.
Vinogradarstvo Istre. (**Viticulture in Istria.**) [English summary 1 p.]
Bibl. Arh. poljopr. Nauke, 1960, **7**(15): 3-85, bibl. 56, illus.

With nearly 15,000 ha. of vineyards and an annual production of 300,000 hl. of wine, vine-growing is the major branch of the agriculture of Istria. The history of the industry and its present status are described, together with the ecological conditions of the production areas and the more important vine varieties. Some 196 varieties found in the province are listed, 91 of which are indigenous, but the number of varieties grown commercially has been greatly reduced during the past 40 years.

4099. De Leon, J.
La viticoltura in Palestina. (**Viticulture in Palestine.**)
Atti Accad. ital. Vite, 1959 (issued 1960), **11**: 231-306, illus.

A comprehensive account, with numerous informative illustrations, of viticulture in the former country of Palestine.

4100. Jones, O. H.
Grape production in the eastern districts of Southern Rhodesia.
Rhod. agric. J., 1961, **58**: 1-11, bibl. 14, illus.

Advice on propagation, establishment, culture, varieties, harvesting and plant protection.

4101. Leitao, J. D. O., and others.
Mécanisation rationnelle de la plantation et de la culture de la vigne. Rapports nationaux. (**Economic mechanization of vine planting and cultivation. National reports.**)
Bull. Off. int. Vin, 1961, **34**(359): 4-18; (360): 4-32.

Portugal and Switzerland. [For reports from other countries, see *H.A.*, 30: 5073, 31: 447 and 2151.]

4102. Bakos, I.
Szőlőtermesztésünk gépesítési kérdései.) (**Problems of the mechanization of Hungarian viticulture.**)
Kert. Szől., 1958, No. 4, pp. 15, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 394.

Factors limiting mechanization are the predominance of small vineyards, the sloping terrain of many vineyards and the height of the vine stakes (160–180 cm.).

4103. Dezső, I.
A nagyüzemi síkvidéki homoki szőlőtermesztés gépesítésének néhány üzemszervezési kérdése. (**Some problems of the organization of mechanization in large-scale vine growing on sandy soils.**) [French and Russian summaries 1 p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 31-48, bibl. 12, illus.

In Hungary the replacement of hand spraying against downy mildew by machine spraying is considered to be the most urgent problem. Sprayers were tested with special reference to area coverage, and it was found that planting vines in bands of

4–5 rows 110–120 cm. apart (total width of bands 5–6 m.), or removing every 5th–6th row in existing plantings, facilitated the mechanization of spraying and also of manuring and all transport work. The replacement of horses or mules by tractors for ploughing would reduce labour requirements by only 18–20% and is at present not contemplated.

4104. PROHASZKA, F., AND OTHERS.
Maintien de l'équilibre économique en matière de viticulture. Mesures palliatives. Rapports nationaux. **(Maintenance of the economic balance in viticulture. Palliative measures. National reports.)**
Bull. Off. int. Vin, 1961, **34**(360): 83-95.

The problems of surplus wines and wine quality: reports from Hungary, Luxemburg, Morocco and Portugal. [For reports from other countries, see *H.A.*, 31: 410 and 2122.]

Vines—breeding and varieties.

(*See also* 3618, 3835, 4133.)

4105. BRUNI, B.
Contributo allo studio della filogenesi viticola. Indagini sulla discendenza di viti da seme. **(A contribution to the study of vine phylogeny. Investigations on generations of vines grown from seed.)**
Atti Accad. ital. Vite, 1959 (issued 1960), **11**: 147-69, bibl. 26, illus.

The origin of *Vitis* species and their genetical constitution are discussed. The plants derived from seeds of numerous varieties were studied, the results confirming the heterogeneity of genetical constitution of practically all the varieties now in cultivation. Special reference is made to the inheritance of hermaphrodite and functionally unisexual flowers.

4106. GARGIULO, A.
Inducción artificial de poliploidía mediante colchicina en *Vitis vinifera*. **(Artificial induction of polyploidy in *Vitis vinifera* by means of colchicine.)**
Vitis, 1960, **2**: 181-9, bibl. 13, illus.

The technique of inducing polyploidy in vines and the methods of detecting mutations are described. Practical applications of these methods in producing triploid seedless varieties and obtaining fertile hybrids from sterile hybrids are discussed.—Univ. nac. Cuyo, Mendoza, Argentina.

4107. WAGNER, E.
Die Feststellung des Geschlechts bei Rebensämlingen. **(The separation of sexes in vine seedlings.)**
Vitis, 1960, **2**: 190-7, bibl. 10, illus.

The method is based on flower morphology and the microscopic examination of the pollen grains. In carmine acetic acid preparations the 2 germination pores on pollen grains from hermaphrodite and male flowers, and their absence on pollen from female flowers, can be seen.—BundesforschAnst. Rebenzücht., Geilweilerhof.

4108. ZIMMERMANN, J.
Die Bedeutung der Wildrebe (*Vitis silvestris* Gmel) in Jugoslawien für Forschung und Weinbau. **(The importance of *Vitis sylvestris* in Yugoslavia for research and vine growing.)**
Wein-Wissenschaft, 1958, **13**: 79, from abstr. in *Mitt. Klosterneuburg, Ser. A*, 1960, **10A**: 271.

Its morphology and biology are described, together with a discussion of its value as a rootstock and in the breeding of resistant varieties.

4109. NASTEV, D.
A contribution to the study of the *Vitis vinifera* subspecies *silvestris* Gmel in the Macedonian P.R. [Yugoslav, with French summary 1 p.]
Annu. Fac. Agric. Sylvic. Skopje, 1958/59, 1959, **12**: 293-318, bibl. 8, illus.

Morphological and physiological descriptions are given of this subspecies, which is found growing on fertile humid soils in the vicinity of the main rivers. The fruit contains 21·60 to 24·95% of sugar and 11·27 to 12·05% of acids.

4110. NÉMETH, M.
Borszőlőfajták összehasonlító értékvizsgálata. **(The evaluation and clone selection of wine grape varieties.)**
Szől. Kut. Int. Évk., 1958, **11**: 261-326, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 230.

This paper mentions a collection of 200 varieties at the Ampelological Research Institute, Pécs, and describes the author's methods of selecting clones therefrom in 4 stages over 12 or more years.

4111. COSMO, I.
Vitigni ad uva da tavola raccomandabili per i nuovi impianti. **(Dessert-grape varieties suitable for planting in new vineyards.)**
Riv. Vitic. Enol., 1960, **13**: 283-94, 319-29, 355-62, illus.

Notes on numerous varieties, grouped according to ripening dates.

4112. SOLDATOV, P. K.
Seedless varieties of grapes. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(7): 34-7, bibl. 12, illus.

Illustrated descriptions from Samarkand of 11 varieties suitable for drying, fresh consumption or wine making.

4113. HARMON, F. N.
Some important varieties of vinifera table grapes introduced since 1946.
Fruit Var. hort. Dig., 1960, **15**: 27-8.

Notes on 13 varieties tested in California.

Vines—propagation and rootstocks.

(*See also* 3857, 4108, 4165, 4212.)

4114. Singh, S. N.
Germination of grape (*Vitis vinifera* L.) hybrid seeds by chilling.
Curr. Sci., 1961, **30**: 62, bibl. 3.

Fully dried seeds stored for 3 months at 40° F. subsequently showed a higher percentage germination than those stored at room temperature or at 35° F.—Hort. Res. Inst., Saharanpur.

4115. Baltagi, B., Calistru, G., and Popa, S.
Sporirea producției de butași prin aplicarea ingrășămintelor. (**Increased production of rootstock cuttings by applying fertilizers in rootstock plantations.**) [English, Russian, French and German summaries 1⅓ pp. each.]
Grăd. Via Liv., 1960, **9**(8): 23-7 + summaries.

Treatment of vine rootstock nurseries with farmyard manure or mineral fertilizers improved the development of main and lateral shoots, hastened wood maturity and increased the yield of shoots suitable for cuttings (7–9 mm. thick). The highest yield of cuttings was obtained with farmyard manure at 40 tons per ha.

4116. Milosavljević, M.
The effect of the duration of stratification on the union and quality of vine grafts. [Yugoslav, with English summary ¾ p.]
Zborn. Rad. poljopriv. Fak. Beograd, 1959, **7**(274): 1-5, bibl. 7.

Experiments with 3 vine varieties grafted on either Berlandieri × Riparia 8B or Berlandieri × Riparia 5BB have shown that grafts stratified at 27° C. for 9 days produced a better union and a higher percentage of top quality plants than those stratified at the same temperature for 18 days. Treatment with NAA resulted in a further improvement of grafts stratified for 9 days.

4117. Eifert, J., Báló, B., and Báló, Z.
Kísérleti eredmények a szőlőoltványok barnafoltosságának megszüntetéséről. (**Experimental results on the eradication of brown spot on vine grafts.**)
Szől. Kut. Int. Évk., 1958, No. 1, pp. 181-212, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 325.

The control of brown spot in vine grafts by the application of paraffin to the cut surface made it possible to examine the effects of cultural methods on its development. Brown spot was found to be induced by the use of well water with a high oxygen content for soaking the stocks before grafting. The immediate cause was the activity of a polyphenoloxidase, which was partly replaced in the spring by a polyphenolperoxidase.

4118. Alley, C. J.
Factors affecting the rooting of grape cuttings.
Amer. J. Enol. Vitic., 1960, **11**: 145-8, bibl. 5.

See *H.A.*, 30: 3459.

4119. Pogorelov, I. T.
The establishment of vineyards by cuttings. [Russian.]
Sadovodstvo, 1960, No. 11, pp. 48-9.

The planting of unrooted vine cuttings in their permanent positions in the field is recommended in preference to the planting of rooted cuttings raised in the nursery. Although the vines from the direct-planted cuttings were a year later in coming into cropping, the cost of propagation and planting was less than one tenth of that for the transplants. Cuttings were prepared by the "kil'čevanije" method, i.e. they were stored overwinter in trenches with their basal ends uppermost. A layer of ice in the bottom of the trench was covered with sawdust. The basal ends of the cuttings were covered with damp sand and layers of humus and hot horse manure.

4120. Ribas, W. C., and Fraga, C. G., Jr.
Comparação de três tipos de mudas na instalação de um vinhedo. (**A comparison of three types of plant in the establishment of a vineyard.**) [English summary 13 lines.]
Bragantia, 1960, **19**: 63-71.

In a trial with Red Niagara (*Vitis labrusca* × *V. vinifera*) on Riparia × Rupestris 101-14 rootstocks, the types of planting material and the total grape yield per 120 vines in the first 4 years of commercial production were (1) grafted plants—387 kg.; (2) rooted cuttings for grafting the following year—589 kg.; and (3) unrooted cuttings for grafting after rooting—534 kg.

4121. Zimmermann, J.
Zur Bewertung des Unterlagenholzes für die Veredlung nach Herkunft und Jahrgang. (**Evaluation of rootstocks for grafting according to origin and age.**) [English, French and Spanish summaries 12 lines each.]
Mitt. Klosterneuburg, Ser. A, 1960, **10A**: 193-202, bibl. 8, illus.

By determining starch and water contents and histological characteristics associated with reduced tendril formation.

4122. Galibert, M. A.
Les porte-greffes en viticulture. (**Rootstocks in viticulture.**)
Fruits et Prim., 1960, **30**: 218-21.

A classification of rootstocks according to their lime-tolerance, vigour and resistance to drought.

4123. Villafranca del Panadés, Estación de Viticultura y Enología.
Los patrones en el viñedo. **(Rootstocks in the vineyard.)**
Rev. Inst. agríc. catal., 1961, **110**: 43-8.

A general introduction dealing with climate, soil, ime tolerance, cultivation requirements and compatibility with scions, followed by notes on 12 ootstocks and recommendations for their use on a variety of soils.

4124. Loladze, V. R.
The influence of rootstocks on grape seedlings. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 44-5.

The growth and fruiting of hybrid seedling grapes grafted on phylloxera-resistant stocks were compared with those of the same seedlings on their own roots. In all cases growth was more vigorous and yields were higher with the grafted plants. The rootstocks used also induced earlier fruiting and arger individual bunch size.

4125. Geisler, G.
Untersuchungen zur Selektion dürreresistenter Reben-Sämlinge und Beziehungen zwischen der Dürreresistenz der Unterlage und den Leistungen des Edelreises. **(Investigations on selection for drought resistance in vine seedlings and the connection between the drought resistance of the stock and the performance of the scion.)**
Vitis, 1960, **2**: 198-207, bibl. 10.

Trials are reported on the resistance to drought (evaluated according to damage to the foliage) among the progeny of crosses between *V. vinifera*, *V. riparia*, *V. rupestris* and *V. solonia* grown in the open, to determine which shoot characters were correlated with drought resistance. It was found that plants with long shoots and weak sucker development had the extensive type of root system that was associated with drought resistance. In grafting experiments with hybrid seedlings of differing drought resistance, it was found that rootstocks of average drought resistance resulted in the highest yields from the scions grafted on them; seedlings with very high drought resistance were of value only for very dry situations [see also next abstract].—BundesforschAnst. Rebenzücht., Geilweilerhof.

4126. Geisler, G.
Untersuchungen über die Bedeutung des Transpirationsverhaltens und der Dürreresistenz von Sämlingen interspezifischer *Vitis*-Kreuzungen für die Unterlagenzüchtung. **(Investigations on the significance of the rate of transpiration and the drought resistance of seedlings of interspecific *Vitis* hybrids for rootstock breeding.)**
Züchter, 1960, **30**: 279-84, bibl. 8.

Hybrid seedlings of Ob. 595 F_1 × Riesling were propagated as cuttings and their drought resistance and rate of transpiration were evaluated. The seedling population was divided into 6 classes, 1–3 drought resistant and 4–6 drought susceptible. In grafting experiments plants of classes 2, 3 and 4 had the most favourable influence on the yield of the scion, whereas plants with the highest drought resistance (class 1) reduced the yield of the scion by 20%.—BundesforschAnst. Rebenzücht., Geilweilerhof.

4127. Mihalca, G.
Ce au arătat experienţele şi practica privitor la comportarea hibrizilor Riparia × Rupestris în plantaţiile de vii din R.P.R. **(The behaviour of Riparia × Rupestris hybrids in Romanian vineyards as observed in experiments and practice.)** [English, Russian, French and German summaries 1 p. each.]
Grăd. Via Liv., 1960, **9**(9): 22-7 + summaries.

Riparia × Rupestris 3309 is resistant to drought and suitable for growing in medium and light compact soils or soils with dry stony subsoils. It is not suitable for heavy wet soils or soils containing more than 25–30% lime, as its resistance to chlorosis is poor. Riparia × Rupestris 101-14 resembles Riparia Gloire and thrives in medium or light compact, fertile, deep soil. The lime content should not be more than 25%.

4128. Lider, L. A.
Vineyard trials in California with nematode-resistant grape rootstocks.
Hilgardia, 1960, **30**: 123-52, bibl. 13.

Trials of rootstock varieties were conducted over a wide range of environmental conditions and over a period of 22 years. The results showed that very vigorous rootstocks with a high degree of nematode resistance are available. Varieties grafted on these can produce high yields on sandy, unfertile, nematode-infested soils. The performances of individual rootstocks are described and tabulated.

4129. Becker, H.
Über die Reblausresistenz der 41-B-Millardet und der Grasset. **(On the phylloxera resistance of 41-B-Millardet and de Grasset.)**
Wein-Wissenschaft, 1958, **13**: 91, from abstr. in *Mitt. Klosterneuburg, Ser. A*, 1960, **10A**: 271-2.

The vine rootstock 41 B (Chasselas × Berlandieri), although frost sensitive, is very lime tolerant, and on heavy calcareous soils is almost free of phylloxera. For heavy cold soils with a high water content Trollinger × Riparia 26 G is considered preferable.

Vines—climate and forcing.

(*See also* 3924, 4125, 4126.)

4130. Pogosjan, K. S.
The temperature and periods of autumn hardening in vines in the Armenian S.S.R. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(6): 25-32, bibl. 12.

Shoots of an early and a late vine variety cut on 1 and 25 November were hardened at 0, —3 and —6° C. and then tested for frost resistance at —17, —21 and —24° C. Buds on shoots cut on 25 November and hardened at —3° C. for 35 days were the least damaged at —17 and —21° C. These shoots had undergone a certain amount of natural hardening, unlike those cut earlier. Shoots cut on 21 December and not artificially hardened were more frost resistant after an autumn in which temperatures were uniformly low than after one in which the temperatures fluctuated. Although the early variety was found to be more frost resistant than the late one, at —24° C. almost every bud was killed on both varieties in all treatments.

4131. Caramete, C.
Rezistenţa la ger a principalelor soiuri de viţă roditoare. **(Frost resistance in the main vine varieties.)** [English, French, German and Russian summaries ½ p. each.]
Grăd. Via Liv., 1960, **9**(12): 13-18 + summaries.

Observations over 5 years showed Coarnă Neagră, Cabernet Sauvignon and Italian Riesling to be the hardiest, and Afuz-Ali, Golden Chasselas and Crîmpoşie to be the most susceptible, to spring frost. The hardy varieties are recommended for planting at the foot of slopes. Where more than 25% of the buds are injured, more buds should be retained on the shoots at the time of pruning or more shoots left to compensate. The covering of vines is recommended even where hard frost is a rare occurrence.

4132. Wäckerlin, O.
Erfolge mit der Frostbekämpfung bei Reben im Frühjahr 1960. **(Results of frost protection of vines in the spring of 1960.)**
Schweiz. Z. Obst- u. Weinbau, 1961, **70**: 117-20.

The effects of heating and of covering the vines with straw mats are discussed, together with data on subsequent yields and quality. Results suggested that coverings became ineffective if temperatures dropped below —5° C. Efficient protection prevented a setback to growth and improved quality as well as yield, especially in Blauburgunder and to a lesser extent in Riesling × Sylvaner.

4133. Csepregi, P.
Csemegeszőlőfajták hajtatási eredményei. **(The results of forcing certain varieties of dessert grapes.)** [French and Russian summaries 1 p. each.]
Kert. szol. Főisk. Évk., 1959, **23**(7): 83-103, bibl. 4, illus.

From observations made on 7 vine varieties planted in a heated house in 1951 it is concluded that forcing is economical and should begin after the requisite dormant period, i.e. about the end of January. Frankenthaler and Afus Ali were the most suitable varieties; Hamburg Muscat had the best flavour, but on account of its uneven berry size, loose bunch and fragile pedicel it had a lower commercial value. As well as forcing, retarding bud burst and keeping the bunches on the plants until February is suggested for out of season production, the variety Italia being recommended for this purpose.

4134. Coomans, M.
Le chauffage des serres à vignes. **(Heating vine glasshouses.)**
Rev. Agric., Brux., 1960, **13**: 609-15.

Notes are given on cultural techniques, temperatures required for forcing, calculation of heat necessary per glasshouse of 240 cu.m. (for early and for ordinary forcing and for low heat) and of external area of pipes per glasshouse (for early and for ordinary forcing), installation of heating apparatus (individual glasshouses, central heating, heating by coal or oil) and practical conclusions (situation, costs and basic guarantees of good heating).

Vines—growth, physiology and reproduction.

(*See also* 4107.)

4135. Alleweldt, G., and Radler, F.
Das Wachstum von Gewebekulturen photoperiodisch vorbehandelter Rebenpflanzen. **(The growth of tissue cultures from photoperiodically treated vine plants.)**
Naturwissenschaften, 1961, **48**: 109, bibl. 7.

One-year-old plants of the vine varieties FS.4-201-39 and Kober 5BB, which differ in their growth response to short-day treatment, were grown under short-day and long-day conditions. After 22 days and 49 days 4 mm. sections of stem were grown on synthetic agar containing 0·1 mg./l. and 1 mg./l. α-NAA. FS.4-201-39 showed little difference in rooting response to the treatments, in contrast to the short-day sensitive Kober 5BB. Cuttings from plants of Kober 5BB given long-day treatment for 22 days showed strong callus but no root growth, whereas cuttings from plants given short-day treatment showed weaker callus than root growth.

cuttings from plants of Kober 5BB given short-day treatment for 49 days showed very weak growth, whereas those from plants given long-day treatment showed a considerable increase of root growth and weaker callus growth. The results were interpreted in terms of auxin metabolism.—BundesforschAnst. Rebenzücht., Geilweilerhof.

4136. RJABČUN, O. P.
The biology of the ageing of grape vines. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(7): 19-25, illus.

Examination of the underground portion of the stem of old grape vines showed discolouration of the central older parts of the stem. Microscopical examination showed that after 20 years the annual rings and the first vessels produced each year became progressively smaller. After 10–12 years the presence of tyloses in the vessels was demonstrated, these elements eventually becoming completely blocked.

4137. TAMÁSI, J., AND SZEGEDI, S.
Szokásos- és mélytelepítésű szőlőtőkék gyökérzetének alakulása sárga futóhomokon. **(The formation of the root system in vines planted at normal and deeper than normal depths on yellow shifting sand.)** [Russian and French summaries 1 p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 143-55. bibl. 9, illus.

Whereas the total length of the roots was greater in vines planted at the normal depth, the roots of the deeply planted vines occupied a slightly larger area.

4138. MATHEY, H., NIJENSOHN, L., AND ZULUAGA, P. A.
Emisión de raíces aéreas en sarmientos de vid por efecto de aplicación accidental de herbicida a base de 2-4 D y 2-4-5 T. **(The emision of aerial roots from vine shoots as a result of the accidental application of herbicides containing 2,4-D and 2,4,5-T.)** [English summary 4 lines.]
Rev. Fac. Cien. agrar., *Mendoza*, 1958, **7**: 73-9, bibl. 1, illus.

The butyl esters of 2,4-D and 2,4,5-T as 1% solutions of commercial herbicides caused vine shoots to produce dense masses of aerial roots, from the nodes in American varieties and from both nodes and internodes in European types. The leaves on these plants were not visibly affected, and no roots developed on leafless stems. The herbicides were used for weed control on a railway skirting the vineyard, and were lethal to the vines nearest the track.

4139. BESSIS, R.
Deux méthodes rapides d'appréciation du nombre de fleurs dans les grappes de la vigne. **(Two rapid methods of estimating the number of flowers in vine inflorescences.)**
Sur différents modes d'expression quantitative de la fertilité chez la vigne. **(Different methods of expressing vine productivity quantitatively.)**
Sur les relations entre le nombre des fleurs et des fruits mûrs dans les grappes de la vigne; pourcentages de nouaison et de maturation. **(Ratios of numbers of flowers to ripe fruits in vine bunches; fruit-set and maturation percentages.)**
C.R. Acad. Agric. Fr., 1960, **46**: 823-8, bibl. 7; 828-32, bibl. 13; 833-8, bibl. 6.

Flower numbers were estimated by counting the flower buds on a number of marked inflorescences and recording, not more than 2 days later, the lengths of these inflorescences and of all those present on the vines concerned. The correlation curve constructed from the marked inflorescences permits rapid determination of flower numbers in all the rest. As the curve will vary according to the age of the inflorescences, it is suggested that the beginning of flower opening should be the standard time for the operation. The average correlation coefficient for the varieties Pinot, Alligoté and Chardonnay was 0·95. A second method of estimation is based on the almost equally high correlation between the number of buds in an inflorescence and its diameter while its shape is still spherical. A binocular microscope is used for counting and the outline of the inflorescence is projected 10 times enlarged to facilitate measurement. The correlation curve is used for finding the number of flower buds in any number of comparable inflorescences of the same variety. The formula proposed for expressing the "practical" fertility of a given eye on a vine shoot is N/t_n, N being the total number of inflorescences produced by the eyes in position *n* on a number of vines and *t* the number of buds left after pruning. A more accurate expression would involve the number of flowers, rather than of inflorescences, produced by the successive buds along a shoot. Graphs show the average numbers of inflorescences per bud, of flowers per inflorescence, and of flowers per bud, for the successive buds on long and short branches of Aligoté and Pinot. In Aligoté fruit set was higher on short than on long shoots, decreasing slightly from basal to apical buds of the latter. In Pinot these differences were not apparent. There were 2 periods of natural fruit suppression, the first lasting less than a fortnight immediately after fruit set, and the second spread over 3 months. Numbers of flowers, fruits set, and fruits ripened, are shown graphically for the successive buds of Aligoté. In this variety the weight of fruit produced by the 2 buds of the short branch was greater than that from the 2 basal buds of the long branch. The application of these studies to the calculation of the yield maximum possible for a given vineyard will be discussed in a further paper.—Lab. Bot., Fac. Sci., Dijon.

4140. Kozma, P., Polyák, D., and Polyák, D. (Mrs.).
Növényi ivari reagensek alkalmazhatóságának tanulmányozasa a szőlőn. **(An investigation on the effect of plant composition on sex expression in vine.)**
Szől. Kut. Int. Évk., 1958, No. 1, pp. 213-25, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 324.

Examination of the sexual clone types (♂, ♀, ⚥ and irregular) of the Kadarka variety showed them to differ substantially in their amino-acid and carotenoid contents.

4141. Kozma, P., and others.
Causes déterminant les altérations de la floraison de la vigne. Rapports nationaux. **(Factors affecting the flowering of the vine. National reports.)**
Bull. Off. int. Vin, 1961, **34**(359): 19-36, (360): 33-48, bibl. 13.

An introduction outlining the factors affecting fertilization of the flowers, and reports from Yugoslavia, Switzerland and France.

4142. Stešenko, F. N.
The role of honeybees in cross-pollinating grape vines. [Russian.]
Pchelovodstvo, 1958, **35**(5): 37-40, from abstr. in *Bee World*, 1960, **41**: 139.

Grapevines are normally wind-pollinated, but experiments on two local varieties in Kazakhstan (Saperava and Nimrang) showed that bees visited them and, under certain conditions. obtained 68–84% of their pollen loads from vine flowers. Pollination by honeybees increased the crop by 38% in the Saperava variety and by 48% in the Nimrang variety. There were no competing flowers when the vines were blooming.

4143. Dvornic, V.
Stabilirea polenizatorilor pentru unele soiuri de viță cu flori funcțional femele. **(The establishment of pollinators for certain vine varieties with facultative female flowers.)** [English, French, German and Russian summaries ¾ p. each.]
Grăd Via Liv., 1960, **9**(12): 19-22 + summaries.

On the basis of experiments the following pollinators are recommended: for Bacatar: Steinschiller and Cadarcă; for Bicane: Afuz-Ali, Cinsaut and Chasselas doré; for Ceauș alb: Afus-Ali and Chasselas doré; for Crîmpoșie: Galbenă de Odobești and Gordan; for Coarnă neagră: Afuz-Ali and Chasselas doré; for Negru vîrtos: Fetească neagră and Negru moale.

4144. Tkačenko, G. V.
The influence of the quantity of pollen on fruit setting in vines. [Russian.]
Agrobiologija, 1960, No. 3, pp. 459-61.

The quantity of pollen falling on the stigmas of naturally pollinated vine flowers was determined at the beginning, middle and end of the flowering period and also after light and heavy rain. This study showed that at the less favourable periods, particularly after heavy rain, supplementary artificial pollination would be desirable. In an experiment with 3 different levels of artificial pollination on 5 varieties the highest level of pollination always gave the greatest fruit set and the largest berries. Sugar content and titratable acidity were unaffected.

4145. Boehm, E. W.
Should you pollen-spray Ohanez grapes?
J. Agric. S. Aust., 1960, **64**: 202-3.

Spray-pollination of Ohanez has a mechanical thinning effect and sets a lighter crop than either bunch rubbing or natural pollination in a season favouring natural pollination. Muscat Gordo, Black Malaga, Sultana and Rosaki are satisfactory pollen producers, but the pollen loses its viability 3–6 hours after preparation. The main pollen spray should be applied when 50% of the caps have fallen from the Ohanez berries.

4146. Gifford, E. M., Jr., and Weaver, R. J.
Effects of 4-chlorophenoxyacetic acid and girdling on the anatomy of Black Corinth grapes.
Amer. J. Enol. Vitic., 1960, **11**: 140-4, bibl. 14, illus.

Spraying or dipping flower clusters of the Black Corinth grapevine in 4-chlorophenoxyacetic acid (4-CPA) at full bloom results in the formation of a good set, but the accompanying formation of hard seeds is objectionable in the dried currants. If sprays are applied 3–7 days after full bloom, the number of berries with hard seeds is greatly reduced. The structure of seeds from nearly mature berries from vines treated with 4-CPA at full bloom is compared with that from berries of comparable age from girdled and control vines. An occasional seed from a girdled vine exhibits a structure generally characteristic of seeded varieties of grapes. No embryos were found in the seeds. However, the inner layer of the outer integument develops into a hard, often multilayered shell. Seeds from control vines degenerate but they do possess a single layer of thick-walled cells in the outer integument. In 4-CPA treated vines there is a wide band of several layers of thick-walled cells, which have had their origin from the inner layer of the outer integument. Pedicels or “capstems” of 4-CPA treated vines are larger in diameter than those of girdled or control vines. The vascular cylinder is much wider and cells of he xylem (wood) are larger than those of girdled or control vines. A general discussion of the anatomical effects of substituted phenoxy compounds on plants is included. [Authors' summary.] —Univ. Calif., Davis.

Vines—planting, training and pruning.

(*See also* 3804, 3972, 4101, 4119, 4120, 4137.)

4147. Naef, J.

Paraffinieren der Jungreben, ein Vorteil bei Neupflanzungen. (**Paraffin coating of young vines; an advantage with new plantings.**)

Schweiz. Z. Obst- u. Weinb., 1961, **70**: 183-4.

Dipping the upper part of the rootstock, the union and the scion into paraffin wax (melting point 52–54° C.) heated to 70–72° C. protects newly planted vines, which therefore need much less attention than usual. In trials over 3 years it was found that paraffin-coated vines grew as well as normally-treated young plants.

4148. Winkler, A. J.

Vineyard studies on vine spacing.

Calif. Agric., 1961, **15**(1): 16.

At several planting distances there were no differences in yield per unit area of land, in compositional balance of the fruit or quality of wines. However, from the economic point of view, rows 12 ft. apart provide sufficient room for cultural equipment, and vines at 6 or 8 ft. apart (according to vigour) in the row are capable of bearing large crops.—Univ. Calif., Davis.

4149. Capucci, C.

L'allevamento della vite nell'Italia centrosettentrionale. (**Vine training in north-central Italy.**)

Frutticoltura, 1960, **22**: 435-54, bibl. 2, illus.

The systems of training, which are described and illustrated by diagrams and photographs, and the yields obtained from them are : modified Filare Cesenate (row training with some live supports), 12–20 quintals [1 q. = 100 kg.] per 100 m.; modified Capovolto, 100–150 q. per ha.; modified Sylvoz, 150–200 q. per ha.; Capucci pergola or modified Romagnola, 250–320 q. per ha.; and modified ray, 350–410 q. per ha. Establishment costs are given.—Univ. Bologna.

4150. Boehm, E. W.

Viticultural research [in South Australia].

J. Agric. S. Aust., 1960, **64**: 90-2, illus.

In a comparison of an overhead trellis, a sloping T-trellis, a square T-trellis and the common vertical trellis used for sultanas the overhead trellis resulted in the highest yield, followed by the sloping T-trellis which was more economical. Both trellises gave a higher proportion of dried fruit per ton of fresh fruit. In fertilizer trials on the Sultana, Currant and Gordo varieties the vines responded to N only, but the increase in fruit weight was offset by the greater susceptibility of the foliage to rain damage and diseases. The variety Shiraz did not respond to N or K, but yields were increased with superphosphate treatment. Fertilization improved soil structure on all plots.

4151. Bernstein, Z., and Fahn, A.

The effect of annual and bi-annual pruning on the seasonal changes in xylem formation in the grapevine.

Ann. Bot., Lond., 1960, **24**: 159-71, bibl. 14, illus.

In irrigated Chasselas Doré vines growing on *Vitis rupestris* rootstocks the growth-ring development and seasonal changes in starch content were examined in annually as well as bi-annually pruned plants. Cambium was generally found to be active from the middle of April to the end of July, with the main period of activity being May to June. As a result of an additional pruning in August a second period of cambial activity began in the middle of September and lasted until the middle of November, with the main activity occurring in October. In the “normal” early summer season cambial activity was found to expand from the canes in a basipetal direction, whereas in the late summer season it recommenced simultaneously in the trunks and canes. In vines that had been pruned twice in the preceding year the early summer xylem increment was smaller than in those which had been pruned only once, and the total increment of two growth-rings per year was similar to that of the one growth-ring in the latter, once-pruned, plants. [From authors' abstract. For earlier work, see *H.A.*, 27: 2222.]—Hebrew Univ., Jerusalem.

4152. Breviglieri, N., and Messerini, A.

Ricerche sulla inibizione dello sviluppo vegetativo ed effetti della potatura verde nella vite. (**Studies on inhibition of vegetative growth and the effects of summer pruning on vines.**)

Atti Accad. ital. Vite, 1959 (issued 1960), **11**: 335-72, bibl. 26, illus.

Descriptions are given of lateral shoot formation on unpruned vine shoots and on those pruned to different extents and at different stages of green growth, also of the effects of summer pruning on the behaviour of latent buds. In applying the results of these studies, it is pointed out that most growers prune too heavily, removing the functional leaves which are not shading the fruit bunches, with unfavourable effects on the composition of the fruit and the nutritional status of the vine. A further adverse effect of early and excessive pruning is the over-production of lateral shoots, which reduce fruit development and are highly susceptible to downy mildew. At least 4–6 leaves should be left beyond the fruit bunch, and in many cases the removal of the shoot tips or, better still, the early thinning out of crowded shoots is sufficient.

Vines—soil management, irrigation and nutrition

(*See also* 3649, 3907, 3942, 4115, 4150, 4279, 4368, 5149, 5560.)

4153. VARICEVA, V. M., AND UZUN, V. T.
The influence of soil erosion in vineyards on the yield and quality of the grapes. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(7); 15-19, bibl. 4, illus.

In a sloping vineyard strips of grass were sown up and down and across the slope, dividing the area into rectangular blocks. Erosion was greatest at the top of each block; some deposition occurred at the bottom of the blocks. When vines were planted on the slope fewer losses occurred in the bottom sections of the blocks, where it was also found that yields were highest. Sugar content of the grapes was lowest in the lower sections of the blocks and was highest in the centre of the blocks.

4154. WITKOWSZKY, E.
Talajerozió kérdése minőségi szőlőültetvényeinkben. (**The problem of soil erosion in high quality vineyards.**)
Szől. Kut. Int. Évk., 1958, **11**: 421-38, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 228.

On loess and sandy soils receiving normal clean cultivation losses through soil erosion ranged from 28 to 198 tons per ha. On slight slopes (3°) ridging and ditching [on the contour?] reduced this loss to a negligible figure, and on slopes of 3°–7° boxing-in from 2 to 18 plants with a ridge and levelling the soil within the box [bench terracing?] was effective in preventing erosion.

4155. MARTIN, T., RUSU, F., AND RUSNAC, D.
Influenţa redesfundatului asupra producţiei şi calităţii rodului viţei de vie. (**The influence of tillage on grape production.**) [English, French, German and Russian summaries ½ p. each.]
Grăd. Via Liv., 1960, **9**(11): 13-15 + summaries.

With the Chasselas doré variety deep tillage to a depth of 50 and 75 cm. increased the total number of shoots and the number of fruiting shoots and inflorescences per vine. The fruit yields per vine and per ha. were also raised, the latter from 7,642 to 18,590 kg. For wooded steppe conditions 50 cm. was the most effective depth of tillage and a dressing of 40 tons fresh garden soil, 600 kg. superphosphate, 180 kg. ammonium nitrate and 400 kg. potash salts should be applied per ha.—"N. Bălcescu" agric. Coll., Bucharest.

4156. CASINI, E.
Recupero della vigoria vegetativa e della produttività nei vecchi impianti viticoli. (**The revival of vegetative vigour and of productivity in old vineyards.**)
Atti Accad. ital. Vite, 1959 (issued 1960), **11**: 170-206, bibl. 9.

Vineyards in Tuscany traditionally receive farmyard manure over ¼ of their area each year (thus each row is manured every 4th year), and are cultivated 20 cm. deep in late spring and 10–15 cm. deep in June and August. In a 5-year experiment 2 modifications of this scheme were compared: (A) replacing the first cultivation by 2 to a depth of 25 cm., one in autumn and one in March, and introducing a 3-year manurial rotation of farmyard- plus poultry manure, chemical fertilizers, and no manure, and (B) advancing the first cultivation to early April and applying farmyard- plus poultry manure in the 1st, 3rd and 5th years. The average annual grape yields in quintals (100 kg.) per ha. were 148·8 from A and 117·3 from B, at least half the difference representing net profit. Significantly fewer vines died under treatment A than under treatment B.

4157. LAZIĆ, S. P.
Prilog proučavanju primene zelenišnog djubrenja u vinogradima. (**A note on green manuring in vineyards.**) [French summary 1 p.]
Arh. poljopr. Nauke, 1960, **13**(40): 70-81, bibl. 17.

The role of a grass cover crop in vineyards under Yugoslav conditions is discussed. *Lolium perenne* has been found to be the most satisfactory species, followed by *Festuca rubra*. *Poa pratensis* is considered unsuitable because of its luxuriant growth. No increase in vine growth or grape yields was noted as a result of adding lucerne to the grass seed, indicating that the main value of the green manure is in providing humus.—Vine Res. Inst., Sremski.

4158. BOURDIER, L.
Trois années de désherbage chimique dans les vignobles du Val de Loire. (**Three years of weed control in the vineyards of the Loire valley.**)
Progr. agric. vitic., 1961, **155**: 28-33, illus.

Diuron at 4 kg./ha. satisfactorily controlled annual weeds and was harmless to vines over 4 years old. Simazine at 5 kg./ha. gave equally good results and was safe with vines of any age. On heavily infested land it could be applied at up to 10 kg./ha. The vines were severely damaged by DNBP at 5 l./ha. in 40 l. of oil, even with careful spraying.

Amino triazole at 10–15 kg. of the commercial (50%) product per ha. was completely harmless to the vines, but its herbicidal action against annuals was not as lasting as that of diuron or simazine. It was, however, the only one of the 3 products that showed appreciable action against thistles, bindweed (*Convolvulus arvensis*) and couch grass (*Agropyron repens*).

4159. Antcliff, A. J.
Chemical control of weeds under vines.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 17, pp. 2.

In a field of currant vines, where the main weeds were *Setaria verticillata, Lactuca seriola, Chenopodium album* and *Xanthium spinosum* and the herbicides were applied shortly after bud-burst. monuron and diuron both at 1·25 lb./acre gave excellent weed control and slightly increased yields.—Commonw. Res. Stat., Merbein, Victoria.—From *Weed Abstr.*, **10**, No. 265.

4160. Gast, A., and Grob, H.
Triazines as selective herbicides.
Pest Technol., 1960, **3**: 68-73, bibl. 2, illus.

Simazine may safely be used in viticulture, since healthy vines are able to metabolize it [see also *H.A.*, 30: 3653]. No detrimental effects on yield or quality were observed after high dosage treatments over several consecutive years. Treatment of vine rootstock nurseries heavily infested with weeds resulted in a 5–6-fold increase in yield of rootstock cuttings. Other crops which tolerate simazine include pome fruit trees, red currants, raspberries, asparagus, sugar cane, citrus, pineapples, bananas and coffee. Some strawberry varieties also show tolerance. Carrot varieties on which propazine may be used are listed.—J. R. Geigy S.A., Basle.

4161. (Doll, C. C.)
Find diuron suitable for weed control with young grape plants.
Ia Fm Sci., 1961, **15**: 672.

Diuron at 3·2 and 6·4 lb./acre gave 90% weed control during the growing season without injuring the vines. Simazine at 2 and 4 lb./acre gave only 50% control. Atrazine, the most effective herbicide at 7, 14 and 21 lb./acre, severely injured the vines.

4162. Leonard, O. A., and Lider, L. A.
Chemical eradication of unwanted grape roots and rootstocks.
Amer. J. Enol. Vitic., 1960, **11**: 51-8, bibl. 4.

Trials were carried out on Rupestris St. George rootstocks and Thompson Seedless vines, using herbicides in the form of foliage sprays, stump treatments or soil-injected fumigants. The foliage sprays and stump treatments were either ineffective or caused damage to surrounding healthy vines, but soil injection of EDB, Telone and D-D, applied at a rate of 200 ml. per plant and at a depth of 8 in., killed 90–100% of the plants without injury to any plants which were more than 24 in. away.—Univ. Calif., Davis.

4163. Mujdaba, F., and Merculiev, O.
Irigarea școlilor de viță în stepa Dobrogeană. (**Irrigating grafted vines in nurseries under the Dobrogea steppe conditions.**) [English, Russian, French and German summaries ½ p. each.]
Grăd. Via Liv., 1960, **9**(7): 15-17 + summaries.

In irrigation trials from 1957 to 1959 in the nursery on the vine variety Pinot gris grafted on Berlandieri × Riparia Kober 5BB the best results were obtained when the soil moisture was 73% of field capacity, achieved by applying a total of 2,200–2,500 cu. m. of water per ha. in 3–4 irrigations between June and the middle of August.

4164. Kissler, J. J., and others.
Long-term study on Tokay vineyard irrigation in Lodi area.
Calif. Agric., 1961, **15**(4): 6-7, illus.
Grape irrigation: sentinels in the soil.
West. Fruit Gr, 1961, **15**(2): 21, illus.

In the first year of a long-term project on vineyard irrigation methods results indicated that irrigation by a single furrow between every other vine row does not provide adequate soil moisture.

4165. Lider, L. A., and Sanderson, G. W.
Some measurements of cation-exchange capacity of grape roots.
Amer. J. Enol. Vitic., 1960, **11**: 174-8, bibl. 11.

Significant differences in mineral composition of the leaf petioles of the scion have been found to be partially influenced by the rootstock variety used. It has been suggested that cation exchange capacity (C.E.C.) might be a contributory factor. Data on C.E.C. values for *Vitis* species and species hybrids are presented, but it does not appear that the variations in scion nutrition on different rootstocks can be explained by the observed differences in the C.E.C. values.—Univ. Calif., Davis.

4166. Gentilini, L., and Cappelleri, G.
La nutrizione della vite nei suoi riflessi esteriori e nella diagnostica fogliare. (**Vine nutrition in its external manifestations and in foliar diagnosis.**)
Atti Accad. ital. Vite, 1959 (issued 1960), **11**: 373-404, bibl. 11, illus.

A fuller account of work reported in *H.A.*, 30: 3484.

4167. BOGNÁR, K.
Tőzegtrágyázás a homoki szőlőkben. **(Peat manuring of vineyards on sandy soils.)**
Szől. Kut. Int. Évk., 1958, No. 1, pp. 409-20, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 327.

Tests over 7 years showed peat moss plus mineral fertilizers to be an excellent nutrient. It decomposed more slowly than F.Y.M., durable humus was formed and the water holding capacity of the soil was increased. No deleterious effect on wine quality was observed.

4168. MOROZOVA, G. S.
Foliar nutrition of vines from a helicopter. [Russian, with English summary 4 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 4, pp. 200-3, bibl. 8.

Three applications of a P, K, B and Mn mixture were made to vines by helicopter at 400 l./ha., with and without the addition of bordeaux, and also by a knapsack sprayer at 1,000 l./ha. without bordeaux. The highest yields and sugar content and the greatest bunch size were obtained when the fertilizers and the bordeaux were applied separately by helicopter.

4169. GAMBARJAN, G. S., AND HAČATRJAN, A. L.
Foliar nutrition and vine diseases. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(4): 28.

Foliar applications of P and K, separately and in combination, increased the resistance of vines to downy and powdery mildews by 15–20%. Over a 3-year period yield increases due to P applications averaged 14·8 centners/ha., to K 15 and to P + K 9·3 centners/ha. A table wine prepared from grapes sprayed with K had a 0·9% higher alcohol content than that prepared from unsprayed grapes.

4170. COSMO, I., PIERI, G., AND GIONCHETTI, G.
Indagini sulla concimazione epigea della vite. **(Investigations on foliar nutrition of vines.)**
Riv. Vitic. Enol., 1960, **13**: 363-75, 407-13, bibl. 32.

The materials used were: copper sulphate at 0·5, 1 and 1·5%; copper nitrate at the same concentrations; urea at 0·6%; and a proprietary product, Foliar, containing 15% each of N, P_2O_5 and K_2O (with and without growth substances). The copper salts were applied at the times appropriate for control of downy mildew and the urea and Foliar 3 times, at fortnightly intervals after flowering. Leaf weight, area and N content were recorded at intervals over the 3 years of the experiment. Fruit production, must composition and the weights of prunings were also recorded. In the year of heaviest infection, copper sulphate was a slightly less effective fungicide than the nitrate at the 2 higher concentrations, but surpassed it at the lowest concentration. Both salts, more particularly the nitrate (which raised leaf N), increased vegetative growth. Urea increased leaf N, vegetative growth and the sugar content of the must. The Foliar product that contained growth substances caused injury to the vines, but the improved form of Foliar (minus growth substances) had a similar action to urea, and also enriched the must in mineral elements.

4171. ARHANGEL'SKAJA, V. V.
The influence of foliar nutrition with phosphorus on the quality of grapes and winter hardiness of vines. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(7): 25-8, bibl. 2.

Vines fed with superphosphate solution applied to their roots were compared with vines to which the superphosphate was applied to the foliage and with others where phosphorus smoke was generated by igniting red phosphorus under the vine. In this experiment foliar feeding resulted in poor growth and fruit low in sugar. Root nutrition and smoking both resulted in good growth of the vines, provided that the smoked vines were either enclosed during the treatment or sprayed with water. Smoke treatment resulted in the highest yield of fruit, and the grapes produced on these vines had the highest sugar content. Smoke treatment was most effective in increasing the sugar content of the grapes if carried out either at flowering time or at the beginning of the ripening period. Winter hardiness was increased most by smoke treatment at the time of flowering.

4172. COOK, J. A., LYNN, C. D., AND KISSLER, J. J.
Boron deficiency in California vineyards.
Amer. J. Enol. Vitic., 1960, **11**: 185-94, bibl. 19, illus.

Symptoms are described and illustrated. Chlorotic leaves contained 7–9 p.p.m. B, and petioles adjacent to clusters, taken at flowering time from deficient Carignane and Thompson Seedless vines, showed B levels of 20–28 p.p.m. Application of B at the rate of 10 lb. of boric oxide per acre is recommended, if the B level in petioles at flowering time drops below 30 p.p.m.—Univ. Calif., Davis.

4173. COOK, J. A., AND OTHERS.
Boron deficiency in vineyards.
Calif. Agric., 1961, **15**(3): 3-4, illus.

Symptoms of B deficiency in a vineyard were correlated with a B level of 4 p.p.m. in the tops of chlorotic shoots, in contrast to 21 p.p.m. in normal shoots. The deficiency was temporarily corrected by applying 2 oz. of fertilizer grade borax (44% boric acid) per vine. Applications of 1 oz. of fertilizer grade borax (36% boric acid) per vine with irrigation water corrected B deficiency in another vineyard, increasing subsequent yields tenfold.—Univ. Calif., Davis.

Vines—grape composition and quality.

(*See also* 3697, 4171, 4332, 4820.)

4174. Stănescu, C.
Indicele gluco-acidimetric al strugurilor—criteriu de apreciere tehnologică a soiurilor de viţă de vie. **(The gluco-acidimetric index of grapes as a criterion for the technological evaluation of grape varieties.)** [English, French, German and Russian summaries $\frac{3}{4}$ p. each.]
Grăd. Via Liv., 1960, **9**(10): 35-43 + summaries.

Working on some 70 grape varieties in the collection of the "N. Bălcescu" Agricultural College, Bucharest, the ratio of sugars content to acid titration at maturity was found to be low in table grapes and ordinary red and white wine grapes (2–4), but higher in those producing wines of a superior quality (4–7).

4175. Amerine, M. A., and Root, G. A.
Carbohydrate content of various parts of the grape cluster. II.
Amer. J. Enol. Vitic., 1960, **11**: 137-9, bibl. 2.

Observations were made on the berries, brush, pedicels, side stems and main stem of 10 clusters each of the varieties Grenache, Semillon and Thompson Seedless, when fully ripe and 3–5 weeks earlier. Results showed that, as the grape matured, the sucrose almost disappeared from the brush and was replaced by reducing sugar. It also decreased in the stem and concentrated in the pedicel. Starch occurred in the brush of the Semillon variety only.—Univ. Calif., Davis.

4176. Nastev, D., and Stefanov, S.
Comparative studies on the quality of grapes in the Tikveš and Bitola regions. [Yugoslav, with French summary 1 p.]
Annu. Fac. Agric. Sylvic. Skopje, 1958/59, 1959, **12**: 319-32, bibl. 7.

The characteristics studied were sugar content and total acidity. In general, all the eight varieties examined developed higher sugar contents and lower acidities in the hotter region, Tikveš, than in Bitola, the averages being 21·08 and 5·64%, and 19·12 and 6·4%, respectively. In both regions, however, varietal differences in both sugar content and acidity remained fairly constant.

4177. Korobkina, Z. V.
Changes in the composition of grapes during storage. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(7): 29-33, bibl. 9.

The changes in the sugar content, acidity, pectin content and ascorbic acid content of the fruit of 12 grape varieties were compared during storage at 0° to 3° C., −1° to 1° C. and −5° to −2° C. At the higher temperatures the sugar content rapidly declined and the acidity increased rapidly with an associated loss of quality. At the lower temperatures there was a sharp drop in acidity during storage, the sugar content being well maintained. In poor keeping varieties the pectin content of the berries declined and that of the juice increased during storage, whereas in good keeping varieties it hardly changed. Ascorbic acid also remained more stable in good than in poor keeping varieties.

4178. Colagrande, O.
Ricerche sulla composizione chimica e sulla maturazione delle uve nel piacentino. **(Investigations on the chemical composition and maturation of grapes in the Piacenta district.)**
Riv. Vitic. Enol., 1960, **13**: 331-42, bibl. 20.

Bonarda and Barbera (red wine varieties), Malvasia (white wine) and Regina (white dessert).

4179. Weaver, R. J., and McCune, S. B.
Influence of light on color development in *Vitis vinifera* grapes.
Amer. J. Enol. Vitic., 1960, **11**: 179-84, bibl. 8, illus.

In experiments with 40 vine varieties bagging after berry set with black or brown waxed bags did not affect fruit colouring, except in the case of Tokay and Sultanina Rose, which remained green in the dark, and Emperor, which developed a slight pinkish tinge. Tokay clusters enclosed in boxes at 50, 60, 70, 80 or 90° F. showed maximum colouration at 60° F.—Univ. Calif., Davis.

4180. Gentilini, L.
Nuove acquisizioni sugli antociani dell'uva. **(New information about the anthocyanins in grapes.)**
Riv. Vitic. Enol., 1960, **13**: 298-300, bibl. 2.

Vines—packing, handling and storage.

(*See also* 4005, 4177.)

4181. Mullins, A. J.
Moist woodwool grape pack.
Dec. Fruit Gr, 1960, **10**: 351-2, illus.

The stems of grapes packed in moist woodwool were significantly greener on arrival at the pre-cooling stores than those packed in dry woodwool, especially during very warm weather, and their flesh temperature was 4° F. lower. When a berry infected with botrytis was introduced into the packs, the spread of infection was slightly greater in the moist woodwool packs. On removal from the pre-cooling chambers there was little difference in the moisture content of the woodwool of the 2 packs, and on arrival at Southampton there was no difference in general appearance of the grapes. —Dec. Fruit Bd, S. Africa.

4182. Douglas, W. S., and Mullins, A. J.
The use of non-returnable containers for marketing grapes in South Africa.
Dec. Fruit Gr, 1960, **10**: 324-8, illus.

The common 5½-in. box as used in the export of grapes proved more satisfactory than the half lug or the various types of carton tested.

4183. Douglas, W. S.
Possible modifications to the export grape pack.
Dec. Fruit Gr, 1960, **10**: 376-9, illus.

It is suggested that the use of the sardine pack or the flat row pack instead of the sloping pack would avoid damage and make more efficient use of the available space. A 4½-in. box could then be used for the 10-lb. export pack instead of the usual 5½-in. box.

4184. Sidwell, A. P., and Golumbic, C.
A quicker way to test raisin samples.
Agric. Mktg, 1960, **5**(12): 10, illus.

A sorting machine is described in which an upward air-blast removes light-weight immature raisins and vine trash from fruit on a conveyor belt.

4185. Ginsburg, L., and de Swardt, G. H.
The keeping quality of the Cardinal grape variety.
Dec. Fruit Gr, 1960, **10**: 323.

Details are given of the condition of grapes after 3 weeks' storage at 31° F. and one week at 50° F. as regards stem condition, sulphur dioxide injury. crescent crack and rot. The weak attachment of the fruit to the pedicel in this variety is the cause of a high incidence of storage deterioration.—W.P. Fruit Res. Stat., Stellenbosch.

Temperate nuts.

(*See also* 3752, 3942, 4005, 5572.)

4186. Goor, A., and Liberman, J.
The almond. [Hebrew, with English summary 3½ pp.]
[*Publ.*] *Dep. Hort., Minist. Agric., Israel*, 1960, pp. 81 + summary, bibl. 32, illus.

History of almond growing in Israel, descriptions of local and imported varieties, propagation, rootstocks, climatic and soil requirements, pests and diseases including control.

4187. Milella, A.
Le principali cultivar di mandorlo della Sardegna. (**The chief almond varieties in Sardinia.**)
Studi Sassaresi, Sez. III, 1959 (issued 1960), **7**: 3-18, bibl. 8, illus.

Descriptions of 14 varieties.

4188. Sarfatti, G.
Studies on the membrane of the almond endosperm haustorium.
Ann. Bot., Lond., 1960, **24**: 451-7, bibl. 12, illus.

For earlier work, see *H.A.*, 30: 3513.

4189. Caprotti, A., and others.
Il nocciòlo per l'Appennino tosco-emiliano. (**Hazel nuts for the Apennine region of Tuscany and Emilia.**)
Atti Conv. Tredòzio (*Forlì*), *1959*, 1959, pp. 87, bibl. 4, illus.

The report includes the following articles: An economic policy for hazel nuts, by A. Caprotti; Aspects and problems of hazel nut growing in the Apennine region of Tuscany and Emilia, by C. Capucci; New trends in sylviculture related to the economy of mountain areas in Forlì province, by A. de Nardo; and Possibilities of extending hazel nut growing, by L. Braconi.

4190. (Hunter, J. H.)
Liming helps pecans.
Amer. Fruit Gr, 1961, **81**(4): 26, illus.

Declining nut yields on light acid soils were found to be due to Ca, Mg and K deficiencies, associated with increasing soil acidity resulting from the use of acidic fertilizers and legume cover crops. Following liming yields gradually increased.—Pecan Lab., Albany, Ga.

4191. Bloch, F., and Brekke, J. E.
Processing of pistachio nuts.
Econ. Bot., 1960, **14**: 129-44, bibl. 7, illus.

New methods are described for dehulling by abrasive peeling machines, separation of split and unsplit nuts, drying, grading by means of an air stream, salting and roasting of shelled nuts and nuts in shells. Data are also presented on the chemical composition of several pistachio varieties and on the equilibrium moisture content of the kernels.

4192. Rockland, L. B., and others.
Studies on English (Persian) walnuts, *Juglans regia*. II. Dehydration of kernels with the belt-trough dryer.
Food Technol., 1960, **14**: 615-18, bibl. 12, from *J. Sci. Food Agric.*, 1961, **12**: i-242.

Kernel moisture was reduced from 15–20% to 3·5% within 65 min. when kernels were dried at 190° F., and within 50 min. when they were dried first at 180° F. and then at 210° F. for equal periods. No significant off-flavours developed, but the kernels developed a slight polish.

PLANT PROTECTION OF TEMPERATE FRUITS.

General.

(*See also* 3616, 3732, 3826, 3828.)

4193. New Zealand, D.S.I.R., and Department of Agriculture.
Current research, investigation and experiments.
Orchard. N.Z., 1960, **33**: 329-31.

Frequent foliar applications of Sevin reduced damage by the pear leaf curling midge. Mildly nfected apple buds worked onto stocks severely nfected with apple mosaic resulted in trees with only mild symptoms. Thinning of Sturmer apples with ANA at 5 p.p.m. plus additives caused just as much breakdown as ANA at 15 p.p.m. Stone fruit variety and rootstock trials are reported. Oleocop (40% cuprous oxide and 25% mineral oil) sprayed on standard lemons at half petal-fall and in early January proved more effective in the control of verrucosis disease than 3 : 4 : 50 bordeaux mixture.

4194. Specht, H. B., and Dondale, C. D.
Spider populations in New Jersey apple orchards.
J. econ. Ent., 1960, **53**: 810-14, bibl. 17.

Mean numbers of predatory spiders in 3 unsprayed orchards were higher than in 7 sprayed orchards. "Hunting" spiders appeared to be more strongly affected by sprays than web-builders.—Canada Dep. Agric., Kentville, Nova Scotia.

4195. Trouillon, L.
Parasites et traitements de l'abricotier. **(Parasites and treatments of the apricot tree.)**
Pomol. franç., 1960, **2**(9): 5-15, illus.

Insects which attack the bark, trunk, leaves and fruit, and fungal and virus diseases are described with appropriate control treatment.

4196. Savzdarg, E̊. E̊.
Protection of currants and gooseberries. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(6): 37-9, illus.

Pest and disease control measures and a phenological calendar as a guide to the timing of sprays.

4197. Savzdarg, E̊. E̊.
Protection of strawberries and raspberries. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(4): 46-9, illus.

Pest and disease control measures and a phenological calendar as a guide to the timing of sprays.

4198. N.S.W. Department of Agriculture, Entomology Branch.
Pests of the grape vine.
Agric. Gaz. N.S.W., 1960, **71**: 420-5, illus.

Damage and control of the vine-leaf blister mite (*Eriophyes vitis*), berry or bunch mite (*Tenuipalpus californicus*), grape rust mite (*Calepitrimerus vitis*), vine scale (*Eulecanium persicae*), grape-vine moth (*Phalaenoides glycine*), grape-vine mealy-bug (*Pseudococcus* sp.), thrips (*T. imaginis*) and light brown apple moth (*Tortrix postvittana*) described.

Disorders of uncertain origin.

(*See also* 3879, 3880, 4034-4039, 4117, 4206.)

4199. Dvořák, J.
Příspěvek k analýze meruněk zasažených apoplexií. (**A contribution to the analysis of apricot trees affected by apoplexy.**) [Russian and German summaries 1 p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 119-35, bibl. 4, illus.

Histological studies on the affected wood of different ages.

4200. Hine, R. B.
The role of amygdalin breakdown in the peach replant problem.
Phytopathology, 1961, **51**: 10-13, bibl. 9.

Hydrolysis rates of amygdalin and the resulting production of HCN were no more rapid in peach replant problem soils than in other soils. The rate of amygdalin breakdown varied only with soil depth, very little being detected below 18 inches. Amygdalin additions to non-autoclaved soil were toxic to growing peach seedlings, but, if a 14-day period elapsed between these additions and planting, tests for cyanide were negative and cyanide injury was not evident. [From author's summary.]—Univ. Calif., Davis.

Viruses.

(*See also* 3885, 3887, 4193, 4223, 5088, 5560.)

4201. Reynolds, J. E., and Milbrath, J. A.
Flowering crab apple varieties as quick indicator hosts for latent apple viruses.
From abstr. in *Phytopathology*, 1961, **51**: 67.

Certain varieties appear useful.

4202. Cation, D., and Carlson, R. F.
Determination of virus entities in an apple scion/rootstock test orchard. Report I.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 435-43, bibl. 5, illus.

When 215 double- and single-worked apple trees were indexed, 119 trees transmitted the chlorotic-leaf-spot syndrome to the indicator. Stem pitting was found only on trees that included Virginia Crab, Delcon, 0-524, Alnarp 2, Golden Delicious and an occasional seedling root in the stock/scion combination. Stem pitting and chlorotic leaf spot appear to be caused by different virus entities.

Differences in the severity of stem pitting were observed. The first demonstration of stem pitting of 0-524 is reported. The Winesap variety used in these tests did not induce stem pitting. One random indexing from a Winesap tree showed definite rubbery-wood symptoms on a Hopa seedling and a Lord Lambourne tree. [From authors' summary.]

4203. Kegler, H., Opel, H., and Herzmann, H.
Untersuchungen über Virosen des Kernobstes. III. Zur Histologie und Physiologie steinfrüchtiger Birnen. **(Investigations on the virus diseases of pome fruits. III. On the histology and physiology of pears infected with stony pit.)** [English summary ½ p.]
Phytopath. Z., 1961, **41**: 42-54, bibl. 35, illus.

Higher contents of dry matter, crude ash, K and Ca were found in infected fruits. Peroxidase and phenoloxidase activities were 2–10 times higher than in healthy fruits, and chlorogenic and isochlorogenic acids, arbutin and two p-coumaric-quinic esters also occurred in increased amounts. Ripening, as measured by the levels of monosaccharides and ascorbic acid, was delayed in infected fruits.—Inst. Phytopath., Aschersleben.

4204. Posnette, A. F., and Cropley, R.
European rusty mottle disease of sweet cherry.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 85-6, bibl. 8, illus.

The symptoms of European rusty mottle, which are described, differ from those of the mild rusty mottle disease in North America; hence the use of the prefix "European". In experiments the disease reduced the growth of mazzard F 12/1 plants by 23%. An attempt to produce healthy budwood from infected Roundel trees by growing them for 18 days at 37° C. was unsuccessful. There is evidence that infected scion wood has been mainly responsible for the spread of the disease in England.

4205. Pine, T. S.
Increased production of geminate buds on peach-mosaic-infected peach trees.
From abstr. in *Phytopathology*, 1961, **51**: 67.

Geminate buds are two complete flower buds on a common receptacle enclosed by a single set of bud scales. Counts of flower buds at bud swell showed that the numbers of geminate buds were significantly greater on trees infected with the peach mosaic virus than on healthy trees. Flowers and fruits from geminate buds were not noticeably aborted. Increased production of geminate buds is considered to be a virus-induced physiological response of the host.

4206. Pine, T. S.
Suspected virus disease, rusty blotch of Japanese plums, found throughout California.
Calif. Agric., 1961, **15**(1): 15, illus.

Symptoms of this possible virus disease are described. The disease has been transmitted by vegetative propagation.—Univ. Calif., Riverside.

4207. Schöniger, G.
ENV-bedingte cytologische Veränderungen in *Fragaria vesca* L. und Einfluss der Infektion auf die Entstehung von Drüsenhaaren. **(Cytological changes in *Fragaria vesca* caused by the strawberry necrosis virus, and the influence of infection on the formation of glandular hairs.)** [English summary 14 lines.]
Phytopath. Z., 1961, **41**: 27-35, bibl. 2, illus.

Both infection with the virus and P deficiency increased the number of glandular hairs on the petiole. P deficiency affected the whole petiole equally, whereas the necrosis virus affected the base more than the top. It is suggested that infection with strawberry necrosis virus induces a state of local P stress. [See also *H.A.*, 31: 493.]—Inst. angew. Bot., Univ. Würzburg.

4208. Miller, P. W., and Aspitarte, T. R.
Evidence that beta-propiolactone can inactivate latent A strawberry virus in *Fragaria vesca* plants.
From abstr. in *Phytopathology*, 1961, **51**: 66.

In preliminary glasshouse tests applications of beta-propiolactone at 4,000 to 8,000 p.p.m. to all above-ground parts appeared to inactivate the virus. Of 75 plants originally infected with the virus, 5 of those treated were "virus-free" when tested 15 months after treatment. Application of beta-propiolactone apparently eliminates the virus, as sub-clonal units from the treated plants were readily reinfected with the virus.

4209. Anon.
Convegno sulla degenerazione della vite. **(A conference on infectious degeneration of vines.)**
Inf. fitopat., 1960, **10**: 398-403, illus.

A brief report on the conference at Voghera in 1960, including details of the proposed clarification of nomenclature of vine diseases allied to infectious degeneration, and giving corresponding names in Italy, France, Germany, England, the U.S.A., Spain and Portugal.

4210. Amici, A., Baldacci, E., and Refatti, E.
In merito alla utilizzazione di piante test erbacee nella diagnostica della virosi della vite (degenerazione infettiva) per inoculazione meccanica. **(The use of herbaceous test plants in the diagnosis of infectious degeneration of vines by mechanical inoculation.)** [English summary ¾ p.]
Ann. Fac. Agrar., Milano, 1958 (issued 1959), **7**: 41-8, bibl. 11, [received 1961].

Contrary to results elsewhere reported, tobacco and

Datura stramonium were the only 2 of 13 species of herbaceous plants which reacted to inoculation with sap from vine leaves containing the virus of infectious degeneration. In both plants the symptoms were of the mosaic type.

4211. BALDACCI, E., AND OTHERS.
New herbaceous test-plants for study of the infectious degeneration of grape vines.
Nature, 1961, **190**: 371-2, bibl. 1.

A progress report on transmission experiments with *Impatiens holstani*, alfalfa, tomato, a *Lycopersicum esculentum* × *L. pimpinellifolium* hybrid and *Ammi majus*.

4212. WILHELM, A. F., AND HOPP, H. H.
Untersuchungen über Rebvirosen. I. Beitrag zur Anfälligkeit von Rebsorten. (**Studies on virus diseases of the grape-vine. I. The susceptibility of varieties.**) [English summary 14 lines.]
Z. PflKrankh., 1961, **68**: 129-44, bibl. 21, illus.

Trials with the new hybrid FS4-201-39 show it to be especially suitable as a test plant for viruses. Yellow mosaic disease and vein clearing are considered to be 2 distinct viruses and can be transmitted by grafting. Line pattern, which appears for a time in every grafted combination, appears to be a shock symptom.—Staatl. Weinbauinst., Freiburg.

4213. OCHS, G.
Gelungene Übertragungsversuche von Viruskrankheiten der Rebe durch Nematoden. (**Successful transmission by nematodes of viruses of the vine.**) [English, French and Spanish summaries 10 lines each.]
Mitt. Klosterneuburg, Ser. A, 1960, **10A**: 97-101, bibl. 18.

Seventeen species of nematodes from the rhizospheres of vines infected with panachure, fanleaf and yellow mosaic were put in pots containing sterilized soil and healthy vines. The ability to transmit viruses would seem to depend on the type of peristome and the size of the virus particles. *Pratylenchus*, *Paratylenchus* and *Criconemoides* transmitted panachure and to a lesser extent fanleaf; *Rotylenchus*, *Tylenchorrhynchus*, *Tylenchus*, *Aphelenchus* and *Aphelenchoides* occasionally transmitted panachure and fanleaf, whereas yellow mosaic was not transmitted by any nematode. [From author's summary.]

4214. OCHS, G.
Vier Virusarten als Ursache der Flavescence dorée der Rebe. (**Four viruses as the cause of flavescence dorée.**)
Naturwissenschaften, 1961, **48**: 26, bibl. 8.

Shown to be caused by a mixed infection with the viruses causing panachure, fanleaf, yellow mosaic and leaf roll.

4215. OCHS, G.
Die kanariengelbe Verfärbung der Rebe. (**The canary yellow colouration of the vine.**)
Rebe und Wein, 1959, **12**: 195, from abstr. in *Mitt. Klosterneuburg, Ser. A*, 1960, **10A**: 261.

A description is given of the symptoms caused by this filiform virus, which occurs only in mixed infections, together with notes on its host range, its bionomics and cultural recommendations for its control.

4216. OCHS, G.
Die Rollkrankheit der Rebe. (**Leaf roll disease of vines.**) [English, French and Spanish summaries 6 lines each.]
Mitt. Klosterneuburg, Ser. A, 1960, **10A**: 203-9, bibl. 31, illus.

A virus 795 Å in length and 23 Å in diameter has been found in each diseased vine plant examined, and transmission by grafting has been proved. In infected plants cellulose and lignin are decomposed into gummoses, and 4-methyl d-glucuronic acid was found to be an intermediate product.

Bacteria.

(*See also* 4221, 4223, 4241.)

4217. JOUANNEAU, H.
Observations sur l'intervention probable d'une bactérie phytopathogène (*Pseudomonas syringae*) dans la genèse de certains accidents fréquemment observés sur pommier, notamment sur la variété Richared. (**Observations on the probable agency of a phytopathogenic bacterium (*Pseudomonas syringae*) in the origin of certain injuries frequently seen on apple trees, especially the variety Richared.**)
C.R. Acad. Agric. Fr., 1960, **46**: 782-5. bibl. 9.

The presence of papyraceous cankers on the branches or trunks of Golden Delicious and Richared apple trees, from which *Pseudomonas syringae* was isolated, was reported in 2 areas.—Stat. cent. Path. vég., I.N.R.A., Versailles.

4218. ROACH, F. A.
Laxton's Superb pear and fire blight.
Agriculture, Lond., 1961, **67**: 574-7, illus.

Laxton's Superb has been found much more susceptible than Conference or Williams' Bon Chrétien and shows a rapid spread of the disease when infected. Laxton's Superb is very prone to develop secondary blossoms on the current season's growth, and these often open in June or July when temperatures are suitable for infection and spread of the disease. Eradication of this variety or grafting trees over to another variety is recommended.—N.A.A.S., E. Malling, Kent.

4219. Crosse, J. E., and Shanmuganathan, N.
Pathogenicity tests with isolates of *Pseudomonas mors-prunorum* from leaf surfaces of sprayed and unsprayed cherry trees.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 87-9, bibl. 3.

Most of the isolates of *P. mors-prunorum* from the surfaces of unsprayed cherry trees and from cherry trees sprayed with streptomycin or bordeaux mixture were pathogenic when inoculated to branches in the winter, but they differed in virulence. There was no clear evidence that virulence was related to previous spray treatment. Trees of the variety Napoleon from the same nursery, and propagated from the same clonal source on the same rootstock, showed different degrees of resistance when inoculated in the orchard. [Authors' summary.]

4220. English, H., and others.
Effect of certain soil treatments on the development of bacterial canker in peach trees.
From abstr. in *Phytopathology*, 1961, **51**: 65.

Development of the canker caused by *Pseudomonas syringae* was studied in peach trees growing in a sandy soil of the San Joaquin Valley of California. The trees were planted on a site from which trees of the same variety (Red Haven) had been removed because of the disease. During the first 3 years after planting no trees were killed by canker where the soil was fumigated with either D-D or Picfume (chloropicrin) prior to planting. The percentages of trees killed by canker in the other soil-treatment plots were: NPK, 12·5; high N, 26·6; dolomite 34·4; magnesium oxide, 39·1; manure plus moderate N, 39·1; calcium oxide, 56·3; autumn irrigation, 67·2; low N, 85·9. The same amount of N was applied to all except the manure and low-N plots. Three-year-old trees in the chloropicrin plot were highly resistant to the disease resulting from artificial inoculation, whereas trees in the autumn-irrigation plot were highly susceptible. Vigour of trees, as measured by trunk diameter, was significantly greater in the fumigated plots than in the other plots.

Fungi.

(*See also* 3755-3757, 3759, 3830, 3839, 3851, 3866, 3867, 3995, 3997, 4028, 4040-4043, 4064, 4169, 4329-4332, 4344, 4967, 5573, 5579.)

4221. Foschi, S.
I marciumi radicali ed il tumore batterico dei fruttiferi. **(Root rots and crown gall of fruit trees.)**
Ital. agric., 1961, **98**: 299-301, illus.

Notes on preventive and control measures for *Armillaria mellea, Rosellinia necatrix* and *Agrobacterium tumefaciens.*

4222. Parker, K. G.
***Verticillium* hadromycosis of deciduous tree fruits.**
Plant Dis. Reptr Suppl. **255**, 1959, pp. 39-61, bibl. 143.

An extensive review of the literature on hadromycosis (caused by various species of *Verticillium*) as it affects stone and pome fruit trees. All commercially grown stone fruits are susceptible: among the pome fruits quince appears to be susceptible, with pears and apples only doubtfully so. The best control is by using a rotation, including non-susceptible crops. Instances are described in which the scion is more susceptible than the rootstock, as in the case of apricot on plum; the reverse condition in which the rootstock is susceptible and the scion not, or only mildly, susceptible is also known, for example, with pear on quince rootstock. [From author's abstract.]—Cornell Univ., Ithaca.

4223. Shea, K. N.
Apple diseases.
Qd agric. J., 1961, **87**: 11-18, illus.

In Queensland only scab and powdery mildew require a routine control programme. Other diseases, also described here, which need occasional control are bitter rot, sooty blotch, armillaria root rot, collar rot, crown gall, *Polystictus* wood rot and certain virus diseases.

4224. Brook, P. J., and Harrow, K. M.
Experiments towards control of bitter rot in apples.
Orchard. N.Z., 1961, **34**: 21-3.

Two experiments are described. The first showed that captan (2 lb. of 50% w.p./100 gal.) was as effective as bordeaux in controlling *Glomerella cingulata* provided a sticker was added. The second showed that some colloidal copper sprays caused excessive russeting, especially when applied 6 times, and they therefore cannot all be recommended to replace bordeaux for use on copper-susceptible varieties. Phaltan, used at the same rate as captan, showed promise.—D.S.I.R., Auckland.

4225. Boekel, P.
Optreden van kanker in fruitbomen. **(The occurrence of canker in fruit trees.)**
Fruitteelt, 1961, **51**: 217.

Soil studies have indicated that canker infection was more severe on soils where the water table often became too high in the autumn and winter. It is recommended that the water table should not be less than 1 m. below the soil surface.—Inst. Bodemvr., Groningen.

4226. Pavlenko, V. V.
The role of windbreaks in the control of black canker of apple trees. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(2): 52, illus.

The causal agent of black canker on apples, *Sphaeropsis malorum*, attacks mainly trees which have been mechanically injured or have suffered frost damage. It was observed that in the north-eastern part of an orchard lacking wind protection 46% of the trees were infected, whereas in the larger part of the orchard surrounded by a forest only 1% of the trees was diseased. Similar reductions in disease incidence were noted in protected parts of other orchards.

4227. BLUMER, S.
Obstbaumkrebs, Rindenbrand und Fruchtfäule. **(Fruit tree bark cankers and fruit rots.)**
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 547-51, 580-6, 603-8, bibl. 27, illus.

In part I an account is given of the symptoms, modes of infection, nutritional requirements and synonymy of various fungi causing cankers on apple and pear trees. Part II deals with an experimental investigation of the modes of infection with the somewhat resistant Schneider and susceptible Goldparmäne apple varieties. Successful infections were made with *Gloeosporium perennans. Gloeosporium album* and *Nectria galligena*. It was shown that these fungi could only establish themselves on dead or inactive wood. In part III the results of inoculating fruits of the variety Glockenapfel with various canker fungi are presented. *N. galligena* made no growth. After 30 days *G. perennans* and *G. album* had produced colonies of 3·5 and 2 cm. surface diameter, respectively. *Monilia fructigena* took 8, *Sphaeropsis malorum* and *Phomopsis mali* 15, and *Cryptosporiopsis corticola* 30 days for the surface diameter to reach 5 cm. To control these fungi in the orchard the following recommendations are made: remove dead wood and fruit; if the infestation is severe, use 2 applications of 1% bordeaux mixture, 1 at the beginning, the other at the middle or end of leaf fall.—Eidg. Versuchsanst., Wädenswil.

4228. PRATELLA, G. C.
Il marciume del cuore delle mele. **(Apple core rot.)**
Ital. agric., 1960, **97**: 973-9, illus.

Core rot, due to *Botryodiplodia malorum, Coniothyrium* sp. and other pathogens, was observed in Stark Delicious in several districts in Italy in 1959. The external and internal symptoms are described and illustrated.

4229. BAKER, J. V.
A method of assessment of apple powdery mildew.
Plant Path., 1961, **10**: 32-7, bibl. 2.

4230. BAKER, J. V.
Mildew control. Tipping can reduce further spread.
Grower, 1961, **55**: 666-7, illus.

A system of pruning to reduce apple mildew infection is described that has given very good results in orchard trials in Cambridgeshire. The aim is to cut out all sources of primary shoot mildew before bud burst. This shoot pruning included tipping (with the removal of 5 or 6 buds including the terminal bud) and removing silvered shoots (to 3 or 4 buds beyond the mildewed area). Neither tipping nor the removal of silvered shoots alone was so effective.

4231. CROXALL, H. E.
Apple mildew.
N.A.A.S. quart. Rev., 1961, **12**: 121-5, bibl. 14.

Recent work on apple mildew control indicates that a heavy infection is best reduced by spraying combined with cutting out, whereas a light infection may be kept to a commercially economic level by spraying alone.

4232. IMMIKHUIZEN, E., AND VAN DER WAAL, M. A.
Meeldauwbestrijding en opbrengst. **(Mildew control and yield.)**
Fruitteelt, 1961, **51**: 206, 217.

Trials have shown that apple yields are directly related to the severity of mildew infection in the previous year. Pinching out infected terminal shoots was as important as spraying for reducing infection. Results from other trials emphasized the importance of keeping down early infection by an adequate spray schedule.—PlZiekt. Dienst. Wageningen and Utrecht.

4233. FORD, E. M., AND FRICK, E. L.
The effect of Epsom salt on the incidence of powdery mildew on potted apple rootstocks.
A.R. E. Malling Res. Stats. 1960, 1961, **A44**: 81-4, bibl. 6.

One-year layers of MM.102 rootstocks were grown in pots with either an adequate or a low level of magnesium supplied to the roots. Following artificial inoculation with *Podosphaera leucotricha* some of these plants were sprayed either once only or at weekly intervals with 2% Epsom salt plus 0·01% di-octyl sodium sulphosuccinate as wetting agent or with the wetting agent alone. Some reduction in mildew attack was obtained with sprays of wetting agent alone, but further control was achieved with Epsom salt/wetting agent sprays. The greatest control was given by a single application one day before inoculation, due apparently to the deposit of Epsom salt remaining on the leaf surface. Evidence for an effect of magnesium nutrition on susceptibility to mildew is not conclusive. No clear relationship was found between the magnesium content of leaves and the degree of infection, suggesting that any effect of magnesium nutrition on susceptibility is of less importance in preventing infection than is the direct fungicidal effect of Epsom salt sprays. [From authors' summary.]

4234. Vlasveld, W. P. N.
De bestrijding van schurft en appelmeeldauw. **(Control of scab and apple mildew.)**
Fruitteelt, 1961, **51**: 476-7, 506-7.

In trials with various combination sprays Golden Delicious was found not to be sulphur-shy, but Karathane + TMTD or Karathane + TEC [bis-(dimethyldithiocarbamoyl)-ethylenebisdithiocarbamate] caused leaf-fall in some trees. The Karathane + Tuzet spray was stopped because of its phytotoxicity. Both scab and mildew were generally satisfactorily controlled by the sprays tested. Observations on the effect of the sprays on *Gloeosporium*, *Gloeodes pomigena* and red spider are also reported.

4235. Austin, M. D.
Controlling apple mildew and scab in East Anglia.
Comm. Gr, 1961, No. 3397, pp. 295-7.

Sulpham (0·6% phenyl mercury dimethyl dithiocarbamate) gave control of scab and mildew at least a good as that with a lime-sulphur/dispersible sulphur programme or a captan/Karathane programme in 2 Essex orchards over 3 seasons.

4236. Greenfield, I.
Sulpham cuts costs of apple disease control.
Grower, 1961, **55**: 547-8.

Scab and mildew control by Sulpham (containing phenyl mercury dimethyl dithiocarbamate) compared favourably with that by sulphur or captan/Karathane programmes, and also gave satisfactory fruit and foliage finish. The cost of materials for a captan/Karathane programme was twice as much per acre as that for Sulpham. [For earlier work, see *H.A.*, 30: 3555.]—F. W. Berk & Co. Ltd.

4237. South Australia Department of Agriculture, Horticultural Branch.
Black spot of apples and pears.
J. Agric. S. Aust., 1960, **64**: 83-4.

Fungicides are tabulated and compared as eradicants and protectants for scab control.

4238. Kulibaba, Ju. F.
A substitute for bordeaux mixture. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(6): 41-2.

A new preparation containing 50–55% 3 $Cu(OH)_2 \cdot CuSO_4$, 5% sulphite liquor, 1% dextrin and not more than 2% water, sprayed in a 1% concentration, reduced scab infection on apples to 8·4% compared with 23·3% obtained with bordeaux.

4239. Williams, B. J.
Some host-pathogen relationships in the apple scab disease.
Diss. Abstr., 1960, **21**: 1328, being *L.C. Card No. Mic.* 60-5810 of 103 pp.

Growth studies with lines of *Venturia inaequalis* on sterilized media prepared from apple tissue showed no differences in growth on preparations from susceptible and resistant host varieties, indicating that host specificity is not associated with nutrition. Inoculation with line 1096 caused increased respiration in leaf tissue of susceptible Cortland, whereas in resistant McIntosh there was no difference in respiration between inoculated and uninoculated tissue. Amino-acid analyses of leaves of McIntosh, Cortland and their seedling progeny showed similar patterns before and after inoculation with line 1096. In artificial media the lines 1096 and 365-4 both grew better with a supply of organic N than with nitrate N. The resistance of McIntosh to line 1096 was hardly affected by supplementing the inoculation with substances from the leaves of susceptible Cortland.—Univ. Wis.

4240. Ozawa, M., and Hirose, K.
The outbreak period of rust disease of apple trees and fungicides for its control. [Japanese, with English summary ½ p.]
Bull. Nagano hort. Exp. Stat., 1960, No. 2, pp. 61-8, bibl. 5.

Sporidia of *Gymnosporangium yamadae* were produced on juniper, the alternate host, in late April and early May, and infection of the apple leaves occurred in mid-May. Organic sulphur sprays (Nocmete and Dithane) were effective in control when applied about 10 May.

4241. South Australia Department of Agriculture, Horticultural Branch.
Diseases of stone fruits.
J. Agric. S. Aust., 1960, **64**: 206-15, illus.

A key to the identification and recommendations for the control of the following diseases are given: leaf curl, prune rust, shot hole, powdery mildew, freckle and bacterial canker.

4242. Tasmania Department of Agriculture, Plant Pathology Division.
Diseases of peaches and nectarines.
Tasm. J. Agric., 1960, **31**: 334-41, bibl. 1, illus.

Symptoms and control of peach leaf curl, brown rot, shot hole, peach rust, peach scab, verticillium blackheart and deficiencies of N, K, Ca, Fe and Mn.

4243. Glaser, T., and Schmidle, A.
Über Hypertrophien an Pfirsichzweigen. **(Hypertrophies on peach shoots.)** [English summary 7 lines.]
Phytopath. Z., 1961, **40**: 373-8, bibl. 9, illus.

Coryneum beijerinckii, *Cytospora* spp. and other fungi and bacteria were isolated from the galls, and infection tests with *Coryneum* showed it to be the causal organism or at least an important factor in gall formation.—Inst. ObstKrankh., Heidelberg.

4244. Tulloch, H. W.
Grafting mastic is best wound protectant for apricot gummosis control.
J. Agric. S. Aust., 1960, **64**: 204-5, bibl. 1.

In a trial of various protectants pruning wounds were covered with a bitumen emulsion + organic mercury, a medical plastic wound dressing, paint or grafting mastic or were left uncovered as a control. After spraying with a water spore suspension of *Eutypa armeniacae* the mastic allowed only 10% of the wounds to become infected, compared with 59% of the control. The figures for the paint, plastic and bitumen treatments were 22, 26 and 51%, respectively.—Nuriootpa vitic. Stat.

4245. Higgs, A. L., and Matthews, C. D.
Lateral pruning for control of apricot dieback.
Tasm. J. Agric., 1960, **31**: 360-6, bibl. 4, illus.

Methods of converting mature trees pruned by the old system to the modified lateral system, and of pruning young trees, to reduce dieback [*Eutypa*] infection are described [see also *H.A.*, 30: 4827]. Lateral pruning also reduces the chances of brown rot infection as a result of the improved aeration of the fruiting wood, and makes the pruning of mature trees easier since few small detailed cuts are necessary.

4246. Chella, G.
Gli albicoccheti vesuviani minacciati da una grave malattia. (**Apricot orchards near Vesuvius threatened by a serious disease.**)
Progr. agric., Bologna, 1961, **7**: 357-60, illus.

At present the only hope of controlling brown rot (*Sclerotinia laxa*) on apricots is the application of preventive measures, including the burning of diseased wood and fruits. The fungicidal treatments recommended are: after leaf fall, and again immediately before bud burst, either 2·5% bordeaux mixture or 0·5–0·6% ziram; at fruit set, and as often as necessary during fruit growth, 0·3% zineb. In manuring the major-nutrient ratio should involve a relatively high proportion of P and K to N.

4247. Touzeau, J.
Les traitements contre la moniliose de l'abricotier en Tunisie en 1958 et 1959. (**Treatments to control *Sclerotinia* infection of apricots in Tunisia in 1958 and 1959.**)
Rapp. Activ. Exp. Déf. Cult. 1959, No. 4, pp. 69-74.

The warning system on which the comparative fungicidal treatments were based proved completely unsatisfactory in the second year, when captan, copper oxinate, copper oxychloride, zineb and sulphur all proved practically ineffective, whereas in the previous year, under conditions more favourable to the disease, the average reduction of infection by the same fungicides was from 16·75 to 5·19%. It is pointed out that weather conditions at the pink-bud and petal-fall stages by themselves are insufficient foundations for a warning system, and that an attempt should be made to discover other relevant factors.

4248. Grover, R. K.
Laboratory and field evaluations of antibiotics and synthetic organic fungicides used for the control of *Sclerotinia fructicola* (Wint.) Rehm. and *Sclerotinia laxa* Ader. & Ruhl. on cherries.
Diss. Abstr., 1960, **21**: 1323, being *L.C. Card No. Mic.* 60-5746 of 115 pp.

Actidione, Phytoactin and Phygon were the most effective fungicides for inhibiting mycelial growth and sporulation of *Sclerotinia fructicola* and *S. laxa*. Actidione semicarbazone was found to be more effective than Actidione. The *S. fructicola* isolate was adapted to grow at higher concentrations of Actidione, Cyprex and Phaltan, while the *S. laxa* isolate grew on higher concentrations of Actidione and Phaltan only. This adaptation is not thought to be a genetic change. In field studies Phytoactin, Actidione and Phaltan were the most effective fungicides for the control of *Sclerotinia* blossom blight. The best fungicides for control of ripe-fruit rot were Actidione spray plus Fermate, Phaltan plus sticker, Cyprex plus Actispray, Cyprex, Fermate, bordeaux, and Actispray plus Phaltan. On the basis of the soluble solids utilization method, Krassa Severa and Griotte du Pays fruits were found to be resistant to rotting by *S. laxa*, and Krassa Severa fruit was also resistant to rotting by *S. fructicola*.—Univ. Wis.

4249. Singh, B. B.
Fruit rot of loquat (*Eriobotrya japonica* Lindl.).
Hort. Advance, 1959, **3**: 128-30, bibl. 2.

The pathogen was identified as *Diplodia natalensis*. Diseased fruits should be discarded before packing.

4250. Moss, D. E.
Shothole reduces almond returns.
J. Dep. Agric. S. Aust., 1961, **64**: 390-3, illus.

The characteristics of infection by *Clasterosporium carpophilum* are described and a method of control using copper sprays is recommended. Ziram and TMTD are also recommended and trials with PMC are in progress.

4251. Smith, H. C., and Newhook, F. J.
Dryberry of boysenberries caused by downy mildew.
Orchard. N.Z., 1961, **34**: 79-81, illus.

Bordeaux mixture used on a commercial plantation gave erratic control of *Peronospora rubi*. On another plantation a programme of sulphur and captan sprays reduced *Peronospora* infection to a low level.

4252. Nichols, M. A.
"Black seed" disease of strawberry fruit.
N.Z. J. Agric., 1960, **101**: 576.

Symptoms of the disease, caused when the strawberry leaf spot fungus (*Mycosphaerella fragariae*) attacks the fruit, are described. Control is obtained by reducing leaf spot to a minimum by using bordeaux mixture 3 : 4 : 50 from early spring to October. Thiram 80% (3 lb./100 gal.) is also effective if applied at 4-week intervals except during flowering, when the interval should be 10–12 days, and during picking, when spraying is omitted.

4253. Talboys, P. W., Bennett, M., and Wilson, J. F.
Tolerance to *Verticillium* wilt diseases in the strawberry.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 94-9, bibl. 15.

Verticillium albo-atrum was found to be more pathogenic to strawberry than the more prevalent *V. dahliae*. Talisman showed a high degree of field tolerance to both species; Cambridge Premier, Cambridge Rearguard, Huxley and Royal Sovereign were moderately tolerant to *V. dahliae*, but only slightly tolerant towards *V. albo-atrum*; both species induced severe disease in Cambridge Vigour. Under the very moist conditions of pot-culture in plunging beds all varieties were tolerant to *V. dahliae*, but only Talisman showed marked tolerance to *V. albo-atrum*. It is suggested that the use of tolerant varieties in the control of these diseases should be combined with periodic measures to reduce soil infectivity, e.g. by rotation or soil fumigation. [Authors' summary.]

4254. Casarini, B., and Rossini, P.
Lenti ma sicuri progressi nella lotta antibotritica in viticoltura. (**Slow but sure progress in the control of *Botrytis* in viticulture.**)
Inf. fitopat., 1960, **10**: 412-15, illus.

Captan and thiram, each at 0·3%, were much more effective than 1% bordeaux mixture or 0·3% zineb against *Botrytis cinerea* on grapes of the variety Montuni, treated 6 times from mid-July to late September. In a previous experiment with the variety Tokay the unsatisfactory results from captan and thiram were probably due to there having been only 2 treatments, 10 and 20 days before ripening.

4255. Zachos, D. G.
Recherches sur la biologie et l'épidémiologie du mildiou de la vigne en Grèce. (**Research on the biology and epidemiology of vine downy mildew in Greece.**)
Ann. Inst. phytopath. Benaki, 1959, **2**: 193-355, bibl. 43.

The biology of *Plasmopara viticola* and factors influencing infection are described. A final chapter discusses the economic aspects of the control measures in use.

4256. Grünzel, H.
Was ist bei der Bekämpfung der *Peronospora* zu beachten? (**What should be considered in *Peronospora* control?**)
Reprint from *Neue dtsch. Obstb.*, [1960?]. pp. 88-9, illus.

Leaves must be wet for 1–2 hours at 18–26° C., 3 hours at 12–15° C. or 4 hours 8° C. for infection to occur, so that measures that aid air movement and drying, such as weed control, soil loosening, wide spacing and high training, will help prevent infection. Zineb 80 (0·2%) and ziram (1·0%) are recommended for the first 2 or 3 sprays, and thereafter bordeaux mixture. Oily flecks occur on the leaves before outbreaks, and their presence can be used as indications of the need for spraying; meteorological conditions can also be used as a guide. Several American rootstocks show resistance, among them the Berlandieri × Riparia hybrids Kober 5BB, SO4 and Teleki 5C.—Inst. Obstzücht. Naumburg (Saale).

4257. Gambarjan, G. S.
Zineb as a substitute for bordeaux. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(1): 39.

Zineb at 0·5 and 0·75% was as good as, or better than, 1% bordeaux against downy mildew on vines.

4258. Popov, M. V.
Chlorbarium bordeaux mixture. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(4): 29.

A comparison was made between chlorbarium bordeaux and bordeaux, each at 1%, applied 3 times in July to vines with an induced severe infection of downy mildew. The combined spray gave a much better and more persistent protection, and is recommended where heavy rains are frequent during the development of mildew. The mixture is prepared by adding an equal weight of barium chloride to the copper sulphate.

4259. Šarić-Sabadoš, A., Milatović, I., and Masten, V.
Peyronellaea glomerata als Erreger der Vertrocknung der Blüten und jungen Trauben der Weinrebe in Jugoslavija. (***Peyronellaea glomerata* as the causal agent of withering of flowers and young shoots of wine grape-vines in Yugoslavia.**) [English summary 9 lines.]
Atti Ist. bot. Univ. Pavia, Ser. 5, 1960, **18**: 101-7, bibl. 12, illus.

The disease appeared in Yugoslavia after the 2nd world war, reducing grape yields by as much as 80%. The pathogen was identified as *Peyronellaea glomerata*, and excellent control was achieved by 2 pre-flowering treatments with bordeaux mixture (0·75–1% copper sulphate) followed by 2 similar treatments (copper sulphate content at 1·5%) after flowering.

4260. TAYLOR, R. H., AND MABBITT, J. M.
Deadarm disease of grape vines.
J. Agric. Vict., 1961, **59**: 157-65, bibl. 22, illus.

Symptoms and varietal susceptibility to *Phomopsis viticola* are described. In trials control has been obtained by the application of one spray of 0·05% PMC during late August to pruned vines.

Nematodes.

(*See also* 3885, 4128, 4213, 4281.)

4261. PITCHER, R. S., PATRICK, Z. A., AND MOUNTAIN, W. B.
Studies on the host-parasite relations of *Pratylenchus penetrans* (Cobb) to apple seedlings. I. Pathogenicity under sterile conditions.
Nematologica, 1960, **5**: 309-14, bibl. 14, illus.

A technique is described for the inoculation, under aseptic conditions, of apple seedlings with the root lesion nematode *Pratylenchus penetrans*. Under these conditions apple feeder roots (i.e. those without secondary thickening) react to nematode invasion by a rapid discolouration of the outermost (i.e. epidermis and hypodermis) and innermost (i.e. inner cortex and endodermis) cortical tissues, but show little or no reaction in the intervening cortical parenchyma. This response is compared with that of peach roots, in which all the cortical tissues are readily discoloured by this nematode. Histochemical tests suggest that sensitivity to *P. penetrans* is correlated with the presence and concentration of phenolic substances in the various tissues of these two hosts. [Authors' summary.]—E. Malling Res. Stat., Kent, and Canada Dep. Agric., Harrow, Ont.

4262. SCOGNAMIGLIO, A.
Infestazioni da nematodi galligeni delle radici al pesco e alla vite. **(Infestations of peach and vine roots by gall-forming nematodes.)**
Progr. agric., Bologna, 1960, **6**: 1383-94, illus.

A review, including brief outlines of control measures.

Mites.

(*See also* 3763, 3765, 3770, 4198, 4234, 4298, 4335-4337, 4339, 4343.)

4263. MÜLLER, E. W.
Untersuchungen über den Einfluss chemischer Pflanzenschutzmittel auf den Populationsverlauf von Spinnmilben und Raubmilben im Obstbau. **(Studies on the influence of sprays on the population dynamics of red spider mites and predacious mites in orchards.)** [English and Russian summaries 30 lines each.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 221-30, bibl. 57, illus.

DDT reduced *Typhlodromus tiliae* populations to a low level. Reduction of the predatory mites resulted in a large build up of red spider mites, whose egg production was also stimulated by DDT. Phencapton and Metasystox also killed *Typhlodromus*. The fungicides ferbam, dinitro-thiocyanate benzene, captan and wettable sulphur did not reduce the predatory mite populations.—Dtsch. Akad. LandwWiss., Berlin.

4264. HENNEBERRY, T. J., AND OTHERS.
Comparative acaricidal activity of Tedion, Ovex and chlorbenside against two strains of the two-spotted spider mite.
J. econ. Ent., 1960, **53**: 841-3, bibl. 7.

Tedion, Ovex, and chlorbenside were tested in the laboratory against a susceptible and a resistant strain of two-spotted spider mite (*Tetranychus telarius*). The fecundity of neither strain was affected by their contact or residual action on the adults. Tedion residues were highly toxic to eggs and larvae of both strains when adult mites fed and oviposited on treated leaves. Ovex and chlorbenside residues were only slightly effective as ovicides. Both had a high larvicidal activity against the susceptible strain, but were less effective against the resistant strain. [From authors' abstract.]—Agric. Res. Serv., U.S.D.A.

4265. DAUM, R. J., AND DEWEY, J. E.
Designing orchard experiments for European red mite control.
J. econ. Ent., 1960, **53**: 892-8, bibl. 35.

The literature regarding mite sampling is briefly reviewed, and two examples of preventive experiments and one of an eradicant-type experiment in apple orchards are presented with statistical treatment and interpretation of results. Data from orchard mite control experiments, in which counts were taken periodically during the season, were analysed statistically as split-block designs. By increasing the number of trees a greater gain in detecting treatment differences was produced than by increasing the number of leaves sampled or the number of sampling dates. In an example, using mild acaricides in a preventive schedule, it was found that the addition of Ovex to a DDT-parathion formulation gave superior control of *Panonychus ulmi*. Glyodin used in place of captan also significantly improved control. A DDT-diazinon tank mix was as effective as most DDT-parathion formulations. [From authors' abstract.]—Cornell Univ.

4266. ASQUITH, D.
Three plans for using acaricides to control mites on apple.
J. econ. Ent., 1960, **53**: 735-7.

Certain acaricides were tested in 1958 and 1959 as control agents for the European red mite, *Panonychus ulmi*, and the two-spotted spider mite, *Tetranychus telarius*, according to three plans: (1) single acaricides alone at standard concentration in consecutive acaricidal applications; (2) two acaricides separately at standard concentration in alternate applications; and (3) two acaricides mixed, with each at one-half standard concentration, in consecutive applications. Test data indicate that plan 3 is better than plan 2. The data also indicate that mixtures of two acaricides, with each at one-half standard concentration, give better control than the weaker of the two applied alone at standard concentration. [Author's abstract.]—Pa St. Univ. Fruit Res. Lab., Arendtsville.

4267. Djadečko, N. P.
A microbiological method of controlling the brown fruit mite. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(5): 36-7.

A 0·025% solution of methyl mercaptophos at 600 l./ha. + 2 kg. of a preparation of the fungus *Beauveria bassiana* gave much better control of *Bryobia redikorzevi* on fruit trees than either material used alone. Similar results were obtained with some other mites, and, when the mixture was added to DDT, codling moth infestation was reduced to 0·3% compared with 27·7% obtained with DDT alone.

4268. Kriegler, P. J.
New outstanding chemicals against pear bud mite.
Dec. Fruit. Gr, 1960, **10**: 302-3, illus.

When applied during the period from ¾ petal drop to about the third week in November, 1 application of Sevin or 2 applications of Gusathion gave effective control of *Eriophyes pyri*.—W.P. Fruit Res. Stat., Stellenbosch.

4269. Ellertson, F. E.
Evaluation of chemicals for control of a spider mite complex on cherry and peach.
J. econ. Ent., 1960, **53**: 522-6, bibl. 3.

Twelve chemicals as sprays or dusts were tested for the control of brown mite (*Bryobia arborea*), two-spotted spider mite (*Tetranychus telarius*) and McDaniel mite (*T. mcdanieli*) on sour cherry and peach trees during 1955-1959. Trithion w.p. and emulsion, Kelthane w.p. and Tedion w.p. provided excellent control of all 3 mite species. Aramite w.p. and ethion w.p. controlled *T. telarius* and *T. mcdanieli*, but not *B. arborea*. The other sprays used were less satisfactory or ineffective. Tedion 3% dust gave good control of small populations of all 3 species. Kelthane 3% dust controlled *B. arborea* only, and the remaining dusts did not control any of the mites.—Mid-Columb. Branch Exp. Stat., Hood River, Ore.

4270. Vukovits, G.
Beobachtungen und Untersuchungen über die an *Prunus*-Arten vorkommende Sternflecken-(Kräusel-) Krankheit. **(Observations and experiments on asteroid spot disease of *Prunus*.** [English summary ⅓ p.]
PflSch. Ber., Wien, 1961, **26**: 1-17, bibl. 15. illus.

Asteroid spot disease is associated with the mite *Phyllocoptes fockeui.* Mites produced typical symptoms after 10 days on young leaves, but the older leaves remained free. A sucking period of 48 hours was sufficient to produce symptoms. Tests on the transmission of the disease by grafting were without result. Control was achieved with 3–4 sprays, during June, July and August, with systemic insecticides or wettable sulphur products. —Bundesanst. PflSch., Wien.

4271. Clinch, P. G., and Higgons, D. U.
Thiodan—a new control for big bud mite.
Grower, 1961, **55**: 484-7, illus.

Two sprays of thiodan are recommended for the control of big bud mites on black currants, applied just after the grape stage and again 3 weeks later. The material is used at 2 pints per 100 gal., and efficiency is improved by a wetter. In the tests reported the number of big buds in heavily-infested plantations was considerably reduced by one season's spraying.—Boots Pure Drug Co., Ltd.

4272. Alymova, V. A.
Economical methods of controlling spider mites. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(4): 27-8.

Ether sulphonate at 0·5% applied alone in May, and in a mixture with 1% bordeaux in June and July, reduced spider mite infestation on vines by 95·8%. The systemics mercaptophos and preparation M-81, both at 0·3%, gave 87·6 and 97·6% control, respectively.

4273. Kriegler, P. J.
The effect of parathion and malathion as winter sprays on the vine-leaf blister mite, *Eriophyes vitis* (Pgst.) (Acarina: Eriophyidae).
S. Afr. J. agric. Sci., 1960, **3**: 473-4, bibl. 1.

Less effective than lime-sulphur in controlling the mite.

Insect pests.

(*See also* 4129, 4193, 4198, 4335-4337, 4339, 4343, 5567, 5593.)

4274. Wright, J. M., and Wade, E. K.
1961 insect and disease control: apples, cherries, strawberries, trees and ornamentals.
Circ. Wis. agric. Ext. Serv. **520c**, revised 1961, pp. 20.

Detailed spray programmes based largely on recent research results.

4275. Isac, G.

Combaterea principalilor dăunători la pomi în regiunile premontane. (**Control of the chief fruit pests in the foothill regions [of Romania].**) [English, French, German and Russian summaries ¾ p. each.]

Grăd Via Liv., 1960, **9**(11): 52-4 + summaries.

BHC and DDT were effective against *Anthonomus pomorum*, *Enarmonia pomonella* and *Hoplocampa testudinea*. For *E. pomonella* Ekatox was even more effective. The most dangerous pest, *Quadraspidiotus perniciosus*, was most readily controlled in the spring by DNOC and in the summer by Ekatox.—Bilcești Fruit Growing Exp. Stat.

4276. Hirose, K.

The effects of sprays on the injurious insect fauna in apple orchards. (Studies on apple pests and their control in Nagano Prefecture. 1.) [Japanese.]

Bull. Nagano hort. Exp. Stat., 1960, No. 2, pp. 21-43, bibl. 22.

4277. Pielou, D. P., and Williams, K.

The effectiveness of residues of insecticides in preventing reinfestation of apple leaves by apple aphid, *Aphis pomi* DeG. I. Diazinon, Trithion and Sevin.

Canad. Ent., 1961, **93**: 93-101, bibl. 19.

The effectiveness of residues in preventing reinfestation was examined by spraying aphid-free apple trees with the insecticides and observing the progress of colonization from nearby sources of infestation. In this way an estimate of the true persistent effect was made, unobscured by the relative differences in the initial kill. On aphid-free trees sprayed with Diazinon, which had a half-life of 0·5 day on apple leaves, and with Trithion (half-life 1·8 days) re-colonization of aphids was almost as rapid as on the check plots. With Sevin (half-life 5·5 days), however, aphids were kept at a commercially low level for 17 days and were still significantly fewer than on the control plots after 27 days. It was also noted that, for the same concentration of spray fluids, initial deposits, determined immediately after drying, were higher with Trithion; this appears to be the result of superior formulation, and the reputation of this material as an insecticide would seem to lie in its effectiveness in an immediate kill on application. [From authors' summary.]—Res. Stat., Summerland, B.C.

4278. Singh, S. M.

Peach leaf-curling aphis (*Anuraphis padi* L.) and its control in the plains of Uttar Pradesh.

Hort. Advance, 1959, **3**: 123-7, bibl. 10.

Control may be effected by destroying eggs, nymphs and adults with contact insecticides. Eggs can be destroyed with oil sprays and DNOC. The best control of nymphs and adults was obtained with 3 washes of 0·003% diazinon during the season. Malathion, parathion and endrin were also useful.—Hort. Res. Inst., Saharanpur, U.P.

4279. Cosmo, I., and Pieri, G.

La calciocianamide come antifillosserico. **(Calcium cyanamide for use against phylloxera.)**

Atti Accad. ital. Vite, 1959 (issued 1960), **11**: 323-34, bibl. 8.

Calcium cyanamide applied as a fertilizer in 6 experiments showed no action, either preventive or curative, against phylloxera on vine roots, but it increased the production of superficial roots.

4280. Kirjuhin, G. A.

Split application of distillation residues of dichloroethane to the soil. [Russian.]

Zašč. Rast. Vred. Bolez., 1959, **4**(4): 43-4. illus.

Methods were tested of applying dichloroethane residues at rates up to 4–4·5 tons per ha. of vineyard for phylloxera control. Split applications carried out during the spring and autumn cultivations in 4–5 treatments were very effective and did not injure the vine roots. The fumigant should be applied in the spring near the soil surface and in the autumn at greater depths.

4281. Princ, Ja. I.

Phylloxera and the problems of its control. [Russian.]

Zašč. Rast. Vred. Bolez., 1960, **5**(4): 53-4.

In tests by the Moldavian branch of the Soviet Academy of Sciences on the control of *Phylloxera vastatrix* in medium black clay soil, it was shown that a single application of hexachlorbutadiene at 25·5 or 75 g. per sq. m., applied with a hand injector to a depth of 25 cm., completely eradicated the pest for at least 2 years. The treatment also controlled the vine nematode and caused no injury to the vines. Tetrachloropropane at 25 g. per sq. m. gave good and more rapid control, but its toxic effect lasted only half as long.

4282. Cox, J. A., Van Geluwe, J., and Lawatsch. D.

Hexachlorocyclopentadiene, a promising new insecticide for the control of the root form of the grape phylloxera.

J. econ. Ent., 1960, **53**: 788-91, illus.

Hexachlorocyclopentadiene applied with a hand injector or as a soil drench at 150 to 200 lb. per acre gave good control of *Phylloxera vitifoliae* on the roots of Concord vines without causing injury.—Pa agric. Exp. Stat., University Park.

4283. Grigorovič, A. F.

Control of bark beetles in fruit trees. [Russian.]

Zašč. Rast. Vred. Bolez., 1960, **5**(3): 37-8. illus.

Of all bark beetles infesting fruit trees the most widespread are the fruit-tree bark beetle [*Scolytus rugulosus*] and the apple bark beetle [*S. pomi*]. The larvae overwinter under the bark and pupate in mid-May, and the adults appear at the beginning of June. The average infestation is about 12%, but in some places it reaches 80% or more. Treatment with DDT and BHC emulsions at 120–200 kg. per ha. before bud burst is recommended. The same compounds may be used in suspension at 100 kg. per ha. or as dusts at 25–30 kg. per ha. The best results were obtained with a 6–10% BHC emulsion, which afforded 90–94% control. An additional treatment of painting the bark with clay containing DDT or BHC increased the control to 91–100%, the toxic effect lasting 2–3 months. Treatment with 1·5% DDT emulsion or 5% DDT suspension at the time of pupation resulted in 8–9 times less infestation, compared with the untreated controls. *Chiropachus colon*, *Eurytomia morio*, *Tomicobia seitneri* and a braconid were found to parasitize the two pests and decreased the incidence of the larval and pupal stages by 5–7%.

4284. Rupajs, A. A.
Otiorrhynchus ovatus, an apple pest. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(3): 56.

A 25% BHC dust applied in early spring to the stems and the surrounding soil gave 92% control.

4285. Briggs, J. B.
A comparison of pitfall trapping and soil sampling in assessing populations of two species of ground beetles (Col: Carabidae).
A.R. E. Malling Res. Stat. 1960, 1961. **A44**: 108-12, bibl. 1.

Trapping did not give a reliable indication of populations of *Harpalus rufipes* and *Feronia melanaria*, both of which damage strawberry fruits.

4286. Jacenko, G. K.
***Eurytoma maslovskii* Nlk.** [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(3): 55.

The chalcid fly, *E. maslovskii*, injures plum and apricot seeds in the Habarovsk and Primorsk regions, whence the seeds are exported to other territories of the U.S.S.R. For control, in addition to orchard sanitation, spraying the trees with 2% milk of lime during oviposition at the end of June is recommended.

4287. Bot, J.
Fruit flies threaten the deciduous fruit industry.
Fmg S. Afr., 1961, **36**(10): 40-2, illus.

In the Transvaal the Mediterranean fruit fly (*Ceratitis capitata*) and the Natal fruit fly (*Pterandrus rosa*) occur in almost equally great numbers. The five-spotted fruit fly (*Pardalaspis quinaria*) is rapidly increasing in importance, but as yet the Marula fruit fly (*Pardalaspis cosyra*) is of very minor interest. All species can be controlled with poison bait consisting of the usual malathion or Dipterex in sugar or in fish albumen. As the five-spotted fruit fly appears earlier in the season than the others, and responds better to a sugar bait, the use of a sugar bait is recommended prior to mid-December and a bait containing fish albumen subsequently.

4288. Myburgh, A. C.
Where are the fruit flies now? I. Summer months.
Where are the fruit flies in late summer and autumn?
Dec. Fruit Gr, 1960, **10**: 348-9, illus.; 1961, **11**: 12-13, illus.

Early and mid-season peach orchards should be bait sprayed immediately after cropping to prevent migration of fruit flies to later ripening varieties. Bait spraying on late varieties should start at about the cropping time of the mid-season varieties, with extra DDT sprays in heavily infested orchards. After April flies leave peach orchards for apples, grapes and pears, and bait spraying of late peach orchards should be extended a few weeks after cropping to protect these other fruits.—W. Prov. Fruit Res. Stat., Stellenbosch.

4289. Shedley, D.
Fruit fly control with Rogor 40 and Lebaycid.
J. Agric. W. Aust., 1960, **1**: 973-4, illus.

These compounds are effective in killing larvae of the Mediterranean fruit fly and preventing egg development in the fruit, and also in killing immature stages in citrus. They have good residual properties and are toxic to adult flies. Cover sprays of Lebaycid on early apricots, peaches and kumquats, and of Rogor 40 on 3 varieties of late canning peaches, Bartlett and Keiffer pears, mandarins, Navel oranges and grapefruit produced crops almost entirely suitable for marketing.

4290. Chancogne, M., and others.
Essais en vergers de poiriers et de pêchers de produits contre *Ceratitis capitata* W. **(Trials in pear and peach orchards of various products against the Mediterranean fruit fly.)**
Phytiat.-Phytopharm., 1960, **9**: 227-32.

Experiments with several phosphoric esters and chlorinated hydrocarbons conducted over 3 years are described. Dimethyl (methylmercapto) methyl phenyl thiophosphate at 100 g. active ingredient/hl. was the most active, and Dimethoate at 30 g. a.i./hl. the next most effective, giving good protection for at least 8 days.—I.N.R.A. Lab. Phytopharm., Versailles.

291. De Pietri-Tonelli, P., Barontini, A., and Santi, R.
Esperimenti di lotta contro la *Ceratitis capitata* Wied. **(Experiments on the control of the Mediterranean fruit fly.)**
[*Publ.*] *Soc. gen. Industr. miner. chim., Montecatini*, 1959, pp. 38, illus., from *Biol. Abstr. Sect. E*, 1961, **36**, Abstr. 8963.

single treatment with Rogor, at 0·05% for eaches and 0·03% for apricots, applied thoroughly hen the fruit was beginning to colour, gave omplete control until harvest without leaving oxic residues.

292. Touzeau, J.
Contrôle de l'efficacité et de la rémanence du mélange malathion + proteines hydrolysées contre la cératite sur pêchers. **(Assessment of the effectiveness and persistence of a mixture of malathion and hydrolysed proteins against the Mediterranean fruit fly on peach trees.)**
Rapp. Activ. Exp. Déf. Cult. 1959, No. 4. pp. 53-60.

n areas in Tunisia where peach orchards were umerous and treatment was not universal, the oisoned bait had to be sprayed at 4-day intervals o maintain control of *Ceratitis capitata* during he critical period of 1 month before harvesting. n isolated orchards, however, 3 treatments at 0-day intervals during the same period were suffiient, the last being 10 days before harvesting.

4293. Orihuela, A.
La mosca mediterranea de la fruta. **(The Mediterranean fruit fly.)**
Agric. venezol., 1960, **24**(220): 13-16, illus.

The main hosts of the Mediterranean fruit fly *Ceratitis capitata*) in Venezuela are citrus fruits, out plums, strawberries, figs and numerous tropical ruits are also attacked. Cultural and chemical ontrol measures are outlined, including a strong ecommendation for the use of a bait containing molasses, hydrolysed protein and Dipterex in itrus orchards.

4294. Still, G. W.
An improved trap for deciduous tree fruit flies.
J. econ. Ent., 1960, **53**: 967, illus.

A trap consisting of a container, such as a half-pint fruit jar, to hold the attractant and a sticky board superimposed on the lid to trap the insects attracted to it has proved highly effective in capturing adults of the apple maggot (*Rhagoletis pomonella*), cherry fruit fly (*R. cingulata*) and black cherry fruit fly (*R. fausta*). To improve the efficiency of the trap a double roof was constructed over it in such a way as to allow maximum lure diffusion and a minimum of rain to enter.—Agric. Res. Serv., U.S.D.A., Sandusky, Ohio.

4295. Seidl, V.
Příspěvek k ochraně proti vrtuli třešňové (*Rhagoletis cerasi* L.) thermickými aerosoly. **(A contribution to the control of cherry fruit fly (*R. cerasi*) by thermal aerosols.)** [Russian and German summaries 1 p. each.]
Věd. Práce ovocn. ČSAZV v Holovousích, 1960, No. 1, pp. 103-15, bibl. 15, illus.

Experiments have shown that treatment against the cherry fruit fly should begin 8–10 days after the adults start to emerge and be repeated 8–10 days later. Time of emergence was determined with the aid of test larvae kept in soil in glass flasks in the orchard. Applications of a 10% DDT aerosol by the hand generator RAG I were 2·5 to 4·5 times more effective, and 4·3 times cheaper, than spraying with 1% Dynol.

4296. Kuz'menko, G. A.
Control of the cherry fruit fly. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(3): 56.

Satisfactory control of the cherry fruit fly [*Rhagoletis cerasi*] was not obtained with two dustings of the tree crown with 5·5% DDT, the first 12 days after the appearance of the adults from the soil, and the second two weeks later. When, however, the soil round the trees was tilled in the autumn to a depth of 14–16 cm. the pupal population was considerably reduced. Complete control was obtained by spraying the tree crowns in mid-May with a mixture of 1% bordeaux, a 0·4% emulsion of 50% DDT and 0·2% anabasine sulphate, followed by a dusting with 5·5% DDT 4 days later and a second complex treatment at the beginning of June.

4297. Giunchi, P.
La carpocapsa del melo e del pero. **(The apple and pear codling moth.)**
Ital. agric., 1961, **98**: 77-80, illus.

As well as feeding on the pulp of apples, pears and stone fruits, the larvae of the codling moth (*Enarmonia pomonella*) attack walnuts, the early generation damaging the pulp and the later one penetrating the kernel. The recommended control treatment comprises 5–7 applications of 0·5–0·6% lead arsenate suspension, plus parathion at 15–20 g. of active material per hl. of water, beginning 10 days after the adult moths appear (2–3 weeks after petal fall in apples). Recent trials with Sevin at 100 g./hl., applied fortnightly, have given very good results. Chemical control should be supplemented by banding the trunks with corrugated cardboard fortnightly from mid-June to September and destroying the pupae thus collected. Storage buildings should have sheets of metal gauze over windows and other openings to prevent emerging adults from reaching fruit trees.

4298. ANON.
Algunas consideraciones sobre el incremento de las plagas de los frutales en el Valle durante la temporada 1959/1960. **(Some observations on the increase of fruit-tree pests in the [Río Negro] valley in the 1959/60 season.)**
Bol. divulg. téc. Estac. exp. agropec. Cinco Saltos 4, 1960, pp. 5.

Codling moth: Observations suggest that this pest may be developing resistance to the most commonly used insecticides. For example, with the use of 200 g. 50% DDT plus 80 c.c. 50% malathion at the same rate in 2 successive years on the same plots the percentage of infested fruit was 0·8 in 1958/59 and 6·1 in 1959/60. Sevin gave good control in recent trials, viz. 2·5% infested fruit. *Red spider mite:* Products which have shown promise at the Station include 20% Acricid w.p. at 100 g. per 100 l., 20% Chlorocide emulsion at 120 c.c. per 100 l., and 45% EPN at 60 c.c. per 100 l.

4299. PAŠČENKO, V. Z.
Methods for the eradication of pupating larvae of the codling moth. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(6): 27-9, illus.

The larvae of the codling moth inhabit mainly the cracks in the bark of the trunk and the thick branches of apple trees. Three sprayings with DDT (one against each generation of the pest) gave a 20% decrease in the number of larvae in young orchards and 70% in old plantations. For the control of older larvae trap bands on the trunk and older branches, soaked in a slurry of 2% parathion and 10% clay soil, are recommended. These bands can be used for several years consecutively. Additional spraying of the bark of the trunk and older branches with 1·5% parathion is also recommended.

4300. BEZDENKO, T. T.
The use of *Trichogramma* spp. for the control of codling moth. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(2): 16-17.

The best time for the control of codling moth by the introduction of *Trichogramma* spp. is during mass oviposition. Of the 3 species known to parasitize the moth, *T. evanescens* is the most resistant to adverse climatic conditions. In 1957-58 the parasites were released during emergence and oviposition. The introduction of *T. evanescens* at the rate of 100,000 per ha. resulted in a 16·2% increase in yield with only 0·5% infestation of the fruit.

4301. BENGSTON, M.
Control of light-brown apple moth.
Qd J. agric. Sci., 1960, **17**: 33-7, bibl. 3.

Spray programmes which included 2 sprays of 0·1% DDD in late November and late January gave effective control of *Austrotortrix postvittana* and avoided the problems of premature leaf fall and residues associated with the use of lead arsenate.

4302. GIŽICKYJ, JA. K.
A dangerous pest of apple in the B.S.S.R. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(3): 55.

Larvae of the moth *Calymnia trapezina* cause severe injury to apple trees in both nursery and orchard. In some orchards 30% of the fruit are now infested. The pest spreads from shelter belt trees, particularly ash and poplar, so these should be sprayed as well as the orchards. An application of calcium arsenate immediately after flowering is recommended for control.

4303. MYBURGH, A. C., AND BASSON, S. G.
The quince and apple borer.
Dec. Fruit Gr, 1960, **10**: 331-3, illus.

Symptoms caused by, and the life history of, *Coryphodema tristis* are described. For effective control the young larvae must be killed during December and January by the application of 3 sprays of DDT 50% w.p. (2 oz.) plus parathion 25% w.p. (1 oz.) per 4 gal. Trees and shrubs which are infested should be removed and burnt. —W.P. Fruit Res. Stat., Stellenbosch.

4304. FALCHIERI, F.
Prove di lotta contro la litocollete. **(Experiments on control of *Lithocolletis*.)**
Inf. fitopat., 1961, **11**: 22-5, illus.

The leaf-mining larvae of the moth *Lithocolletis blancardella* are particularly common on the apple varieties Abbondanza and Delicious. Excellent control of the larvae was achieved by spraying with Dipterex at 200–250 g./hl. (0·16–0·2% of active material). The youngest larvae were the most vulnerable, and the pupae in their cocoons were highly resistant. Insecticides which proved unsatisfactory were lindane plus coumarin-phosphoric ester, parathion plus DDT, and ethyl Guthion.

4305. BASSON, S. G.
Increasing infestations of leaf rollers predicted.
Dec. Fruit Gr, 1960, **10**: 329-30, illus.

Effective control of leaf rollers on deciduous fruit trees is obtained with both Sevin and Gusathion at 1 lb./100 gal. sprayed throughout the season from November onwards. At least 1 more spray should be applied after completion of the codling moth spray programme, to prevent reinfestation, especially where cover crops are present in the orchard. [For earlier work, see *H.A.*, 31: 2292.]—W.P. Fruit Res. Stat., Stellenbosch.

4306. van Frankenhuyzen, A.
Spinselmotten (*Hyponomeuta* soorten). **(Ermine moths, *Yponomeuta* spp.)**
Fruitteelt, 1961, **51**: 160-2, illus.

Young caterpillars can be controlled as they leave their tunnels in the leaves by spraying with 0·1% Gusathion, 0·3% malathion or 0·2% Thiodan.—PlZiekt. Dienst, Wageningen.

4307. Sansavini, S.
Danneggiamenti delle nottue ai peschi. **(Injury to peaches by noctuids.)**
Inf. fitopat., 1961, **11**: 42-3, illus.

The larvae of noctuid moths, particularly *Barathra brassicae*, frequently migrate from beet to certain early varieties of peach that may be growing sufficiently near, damaging the leaves and particularly the fruit. In such cases the pest should be dealt with on the beet to prevent the migration. The lowest peach branches should be kept from touching the ground, and the trunk bases should be wrapped round with tarred paper or with some other repellent. Gammexane treatment of the soil round the trees has given good control.

4308. Giunchi, P.
Le tignole del pesco. **(Peach moths.)**
Ital. agric., 1960, **97**: 1032-5, illus.

Notes on the control of *Cydia molesta* and *Anarsia lineatella*.

4309. Falanghe, O., and Netto, N. D.
Inseticidas para combater a broca da figueira. **(Insecticides for controlling the fig borer.)**
Biológico, 1960, **26**: 195-8, bibl. 3.

The larvae of the moth *Azochis gripusalis* in fig shoots were very satisfactorily controlled by adding 400 g. of 50% DDT wettable powder or 500 c.c. of 50% Dipterex emulsion to each 100 l. of bordeaux mixture used as a fungicide, and applying the mixture 6 times at fortnightly intervals. The addition of 200 g. of 50% dieldrin wettable powder appeared to favour the spread of the pest in both experimental seasons.

4310. Cairaschi, E. A., and Perrier, D.
Essais de traitements chimiques contre les insectes de châtaignes dans les Cévennes au cours des campagnes 1957-58-59. **(Trials on the chemical control of insects on sweet chestnut in the Cevennes in 1957-59.)**
Phytiat.-Phytopharm., 1960, **9**: 95-113, bibl. 6.
Cairaschi, E. A., and others.
Les insectes des chataignes et des marrons. **(Sweet chestnut pests.)**
Problèmes de lutte chimique dans la châtaigneraie. **(Problems of chemical control in the chestnut crop.)**
C.R. Acad. Agric. Fr., 1960, **46**: 718-22; 723-7, bibl. 12.

The results of earlier trials with organic halogen insecticides, including DDT and BHC, were unsuccessful. In the present trials with phosphoric esters Gusathion at 50 g. active ingredient per hl. gave up to 80% control of *Laspeyresia splendana* and *Balaninus elephas* and had a residual effect for about 7 days. Dieldrin was less successful. Three weekly treatments should be applied, beginning in the early days of September.—Stat. cent. Zool. agric., Versailles.

4311. Čikviladze, I. D.
An effective preparation against cutworm larvae. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(3): 56.

Of 14 species of cutworms found on vines in Georgia the following are the most widely distributed and dangerous: *Agrotis segetum*, *A.c-nigrum*, *Euxoa aquilina*, *Triphaena pronuba* and *Laphygma exigua*. In control trials soil applications of BHC dust, alone or with phosphorite, have given good results.

4312. Delmas, R.
Essai d'insecticides de groupe des esters phosphoriques en traitements curatifs contre la cochylis. **(Trials of insecticides of the phosphoric ester group for the control of *Clysia ambiguella*.)**
C.R. Acad. Agric. Fr., 1960, **46**: 689-94.

Ethylated parathion was more effective than other phosphoric esters in trials on vines in Gard in 1958 and 1959. It was 84–87% effective against the second generation in 1958 and 99–100% effective against the first and second generations in 1959.

4313. Chaboussou, F.
Essais de divers insecticides contre la cochylis (*Clysiella ambiguella* Hb) et l'eudemis (*Lobesia botrana* Schiff.) dans le Bordelais en 1959. **(Trials with various insecticides against *Clysia ambiguella* and *Lobesia botrana* in the Bordeaux district in 1959.)**
C.R. Acad. Agric. Fr., 1960, **46**: 694-702.

Six insecticides were tested on several vine varieties with a view to finding a substitute for parathion, which permits increases in the *Tetranychus* population. None was as effective as parathion in controlling the grape moths, but promising results were given by Phosdrin, Sevin and dimethyl methyl mercaptoethylthiophosphate.

4314. Stafford, E. M., Jensen, F. L., and Kido, H.
Control of the grape leaf folder in California.
J. econ. Ent., 1960, **53**: 531-4, bibl. 5.

Sprays of endrin, Sevin, acid lead arsenate and spores of *Bacillus thuringiensis* were effective in controlling first-brood larvae of *Desmia funeralis*. Control was less persistent with the *Bacillus* spores. Dusts of endrin, Sevin and parathion, but not of the *Bacillus*, controlled second- and third-brood larvae. Of some newer insecticides tested dimethoate and Bayer 22408 (0,0-diethyl 0-naphtalimidophosphorothioate) were promising. Sevin and dimethoate also controlled grape leafhoppers (*Erythroneura elegantula*).—Univ. Calif., Davis.

4315. Taschenberger, E. F., Parsons, G. M., and Moorefield, H. H.
Performance of Sevin against grape berry moth.
J. econ. Ent., 1960, **53**: 856-9, bibl. 7.

Sevin 50% w.p. at 2 lb. per 100 gal. was as effective as the standard DDT spray for the control of grape berry moth, *Paralobesia viteana*. Sevin was found to be compatible with several copper compounds of low solubility and with the fungicide Phaltan, but incompatible with copper fungicides containing hydrated lime. Deposits on fruit were reduced by 32–40% in 7 days and by 85% or more within 4 weeks. Residues in the juice were similar to those found on the fresh fruit.—N.Y. St. agric. Exp. Stat., Geneva.

4316. Bognár, S., and others.
Védekezés a szőlőilonca (*Sparganothis pilleriana* Schiff.) ellen lombos állapotban. **(Control of *Sparganothis pilleriana* on vines in leaf.)**
Növényvéd. Idő. Kérd., 1957, No. 2, pp. 47-53, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 350.

In the pre-blossom period with 0·2% Ekatox, 0·6% Wofatox or 0·4% Pernit, and by keeping weeds to a minimum.

4317. Kiskina, O. G.
Chemicals for control of scale insects and pseudoscale insects. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(5): 41-2.

The best control of *Diaspidiotus perniciosus* on deciduous fruit trees was obtained with 2% carbolineum emulsion plus 1% DNOC, which gave a 98·8% kill of the larvae. The greatest mortality of the adults was obtained with preparation No. 30, consisting of a mixture of 40% diesel oil, 40% paraffin distillate, 2% sulphite liquor, 0·5% surfactant and 17·5% water. A 100% mortality of *Eulecanium corni* on plum trees was obtained with a 6% emulsion of preparation No. 30; early spraying with 2% carbolineum emulsion plus 0·5% DNOC gave 99·4–100% control.

4318. Anon.
La cocciniglia bianca del pesco e la cocciniglia a virgola dei fruttiferi. **(White scale of peach trees and oystershell scale of fruit trees.)**
Progr. agric., Bologna, 1961, **7**: 100-1.

Diaspis pentagona, the white scale pest of peach, cherry and mulberry trees, has become more abundant in Italy since its chief parasite *Prospaltella berlesei* has been eliminated by chlorinated and organic phosphorus insecticides. Recommended control measures include spraying with 4% anthracene oil mixed with either barium polysulphide at 7° Bè or calcium polysulphide at 6° Bè. White oils at 3–4% are applied in winter. Where infestation is severe, spring and summer treatments can be carried out with 0·3–0·4% white oil reinforced by parathion. The same measures are advised against the oystershell scale pest (*Mytilococcus ulmi*) of fruit trees.

4319. Richards, A. M.
Scale insect survey on apples 1959-60.
N.Z. J. agric. Res., 1960, **3**: 693-8, bibl. 3.

San José scale was the most widely distributed of 7 scale species found in a survey of 91 orchards in New Zealand.

4320. Flanders, S. E.
The status of San Jose scale parasitization (including biological notes).
J. econ. Ent., 1960, **53**: 757-9, bibl. 17.

Quadraspidiotus perniciosus in North America and elsewhere.

4321. Bičina, T. I.
A schedule for the control of San José scale. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(6): 46-8.

San José scale (*Aspidiotus perniciosus*) has greatly increased in the Moldavian S.S.R., injuring mainly apples, pears, plums, cherries, peaches and currants. The damage is greater in low situations. The optimal conditions for its development are a summer temperature of 25° C. and 50–60% relative humidity. The two predatory insects *Chilocorus bipustulatus* and *Exochomus quadripustulatus* and the parasite *Prospaltella perniciosi* have no economic importance, and chemical control remains the only adequate measure against the pest. Spraying before bud burst with 0·5% Wofatox [methyl-parathion] emulsion or 1·5% emulsion of 20% DDT gave 95·6 and 96% control, respectively. The following schedule is recommended. In early spring, before bud burst, spray with 1% DNC, 8% carbolineum emulsion, 4% emulsion of preparation No. 30, or 3% emulsion of preparation No. 30 plus 0·5% DNC. These treatments are effective only after pruning, scraping down the bark and removal of weed growth round the roots. During summer spray with a 2% emulsion of preparation No. 30 plus one of the following: 0·15–0·2% DDT, 0·2% methyl parathion, 0·1% dithiophos, 0·1% parathion or 0·1% methylethyl parathion. In severely infested districts 2 applications must be given during the summer.

4322. Đulizibarić, T.
Efikasnost zimskog prskanja DNC i DNBP preparatima, pri nepovoljnim vremenskim prilikama. **(The effectiveness of winter spraying with DNC and DNBP preparations under unfavourable conditions.)** [English summary 1 p.]
Zašt. Bilja, 1960, No. 57/58, pp. 229-38.

DNC and DNBP preparations at standard rates gave immediate and almost complete control of San José scale (*Aspidiotus perniciosus*) on red currants and apples. Subsequent washing off by artificial rain within ½ hour to 96 hours had no effect on the insecticidal action of the materials. Applications made at various temperatures below and above 0° C. showed that the efficacy of these chemicals was not reduced by temperatures down to −2° C.

4323. Vogel, W., Gerber, B., and Staub, A.
Kann die San José-Schildlaus durch befallene Früchte verschleppt werden? **(Can the San José scale be spread by infected fruit?)**
Schweiz. Z. Obst- u. Weinbau, 1961, **70**: 105-11, illus.

It was shown that fallen infested pears in contact with stems of red currants could serve as a source of infection. The larvae could not actively cross 40 cm. of cleared ground but could be carried much greater distances by the wind.—Eidg. Versuchsanst., Wädenswil.

4324. Maxwell, C. W.
Field tests of insecticides against the thrips *Frankliniella vaccinii* Morgan and *Taeniothrips vaccinophilus* Hood on the low-bush blueberry.
Canad. J. Plant Sci., 1961, **41**: 134-6, bibl. 4.

The application of insecticides to the surface of the soil as the new sprouts are appearing following the spring burning of blueberry fields has proved more satisfactory in the control of both thrips species than applications made at other times. Aldrin sprays at 0·75 lb. of toxicant and dieldrin dust at 0·5 lb. of toxicant per acre were significantly more effective in plot tests against these thrips than the other insecticides tested. Sprays of heptachlor, endrin, dieldrin and DDT and dusts of heptachlor and DDT were not significantly different from one another. As spraying is not practicable in commercial blueberry areas in the Maritime Provinces, a 2½% dieldrin dust at 20 lb. per acre was tested in several commercial fields; it proved as effective as in the plot tests and is recommended to growers. [From author's abstract.]—Canada Dep. Agric., Fredericton, N.B.

Other pests.

(*See also* 5593.)

4325. Lange, J., and Bogatich, V.
Here's how to control starlings in orchards.
Bett. Fruit, 1961, **55**(7): 23-5, illus.

The construction of a large cage to trap starlings is described.

4326. Toenjes, W.
Virginia crab apple stock shows some resistance to girdling by meadow mice.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 298-302, illus.

The bark appeared to be unpalatable to mice.

4327. Ryker, T. C.
Protecting orchards and woodlands with chemical repellent for browsing animals.
Agric. Newsl., 1961, **29**(1): 6-7, bibl. 3, illus.

Arasan 42-S (thiram), applied by brush, hard pressure sprayer or hose sprayer to apple trunks, will act as a repellent to rabbits. Protection is improved by the addition of a sticker.

4328. Vanwetswinkel, G.
Hazen- en konijnenschade aan jonge fruitboompjes. **(Damage to young fruit trees by rabbits and hares.)**
Cult. Hand., 1960, **26**: 385-6, illus.

Four methods of reducing rabbit and hare damage are mentioned, the most successful being to smear the trunk up to the lowest branches with "Kankerdood". Trees so treated were not gnawed, while up to 80% of the unprotected trees were attacked.

Chemicals and their application.

(*See also* 3771, 3809, 3814, 3830, 4103, 4238, 4258, 4263.)

4329. Torgeson, D. C., and Lindberg, C. G.
A greenhouse method for evaluation of chemicals to control apple powdery mildew.
Contr. Boyce Thompson Inst., 1961, **21**: 33-4, bibl. 4.

Using the method described below, chemicals may be evaluated either as protectants or eradicants. Seedlings raised from seed of McIntosh apples are potted individually and when 6 leaves have developed they are ready for use. In the protectant test the plants are placed on a turntable and sprayed with the test chemical. These plants are then intermixed with heavily infected seedlings. Spraying and exposure to infection is then repeated before the chemical is evaluated. Eradicant tests are similar, except that the test plants are exposed to spores prior to a single spraying. Correlation between the results obtained in these and in field tests has been good.

4330. Kirby, A. H. M., and Bennett, M.
Phytotoxicity trials of certain fungicides on Lane's Prince Albert apple.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 113-15, bibl. 1.

Trees of the apple variety Lane's Prince Albert, on M.VII, were sprayed twice pre-blossom and thrice post-blossom during four successive seasons with dinocap (2:4-dinitro-6-(1-methylheptyl)-phenyl crotonate; DNOPC), or captan, or both. Dinocap, at 0·05%, caused consistent reduction of fruit set and mature (August) fruit as compared with captan alone; dinocap plus captan was intermediate in effect on fruit set, but mature fruit and picked crop were very similar to those for captan only. More stalk-end russet was caused by dinocap alone than by the other two treatments in 1956, but not in the preceding three seasons. The conclusion is drawn that the addition of captan to enhance scab control also confers a wider margin of safety where dinocap is used for control of apple mildew. [Authors' summary.]

4331. CASARINI, B., ERCOLANI, G. L., AND GOVI, G. Influenza degli anticrittogamici sull'allegagione dei fiori di melo. **(The effect of fungicides on fruit set in apples.)**
Progr. agric., Bologna, 1961, **7**: 240-51, illus.
Of the 5 fungicides used for scab control in 4 apple varieties, phenylmercury acetate caused the greatest reduction in fruit set. Captan and zineb were the least harmful, and thiram and copper-calcium oxychloride were intermediate.

4332. GOELDNER, H., AND STELLWAAG-KITTLER, F. Über den Einfluss verschiedener Wirkstoffe zur Peronospora-Bekämpfung im Weinbau auf Menge und Güte. **(The influence of different fungicides used against peronospora on the yield and quality of grapes.)**
Weinberg u. Keller, 1960, **7**: 433-44, bibl. 26.
With low yields a small increase in yield as a result of fungicide treatment resulted in a considerable reduction in quality, whereas a decrease in yield improved quality. A similar relationship was found with high yields. With medium yields, however, an increase of up to 40% in yield had only an insignificant influence on quality. Individual fungicides showed specific relationships, modifiable by weather, soil and situation. In cool, wet years zineb and copper fungicides gave the best results, and copper fungicides were good in hot dry years also. A mixture of the two gave poor results. Captan was better in dry than in wet years.—ForschAnst. Gartenb., Geisenheim.

4333. CRANG, A., AND CLARKE, G. M.
Effects of some fungicides on the flavour of fruits and syrups.
J. Sci. Food Agric., 1961, **12**: 227-34, bibl. 4.
The effects of the fungicides captan, Karathane (Dinocap), thiram and lime-sulphur on the flavour of strawberries, gooseberries and a buffered cane sugar syrup acidified with citric acid were assessed before and after bottling, canning and freezing. Captan at 5 p.p.m. increased the rate of corrosion of the cans and caused some taint in canned and bottled syrups, but was not detected before processing; when used as a spray on strawberries it caused slight taint of fresh or canned fruit in 2 yearly tests out of 5. Karathane at 10 p.p.m. was not detected in the syrup and had no effect on the cans; it caused no taint in 1 year's trials on gooseberries and strawberries. Thiram at 2 p.p.m. increased the rate or corrosion of cans and caused a distinct taint in canned, but not in bottled, syrups, although it was not readily detected before processing; it caused marked taint in much of the fruit tested over 5 years, especially after canning. [From authors' summary.]—Long Ashton Res. Stat., Bristol.

4334. GAMBRELL, F. L., AND GILMER, R. M.
The influence of insecticide-fungicide spray programs on the growth of apple nursery trees.
J. econ. Ent., 1960, **53**: 717-19, bibl. 3.
Applications each year over a 3-year period of 4 fortnightly sprays, containing insecticides and fungicides, increased the vigour and improved the condition of nursery trees of 4 varieties of apple. Sulphur was the most effective fungicide and demeton-DDT or lindane-DDT gave very good insect control. The effects of insect and disease control appeared to be cumulative over the 3-year period. Less vigorous varieties showed a greater benefit from spraying than more vigorous varieties, but significant gains from spraying were obtained with all varieties. [From authors' abstract.]—Cornell Univ.

4335. ŠČERBAKOV, V. V.
DDD and ethyl DD for the control of fruit pests. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(4): 37-8.
DDD (4,4-dichlorodiphenyl dichloroethane) and ethyl DD (2,2 bis (4-ethylphenyl) dichloroethane), which are less toxic to warm blooded animals than is DDT, gave about as good control of codling moth on apples as did DDT, and when mixed with ether sulphonate they also controlled brown fruit mites. The effectiveness of DDD and ethyl DD against some pests of other fruit trees is indicated.

4336. POWELL, K. M.
Gusathion and its uses.
Pest Technol., 1960, **2**: 136-9, illus.
Gusathion (1½ pt./100 gal., applied at 200 gal./acre) is at present recommended only for use on apples (5 applications per season) and pears (3 applications per season) with a period of 3 weeks between the last application and harvesting. It gives effective control of codling moth, tortrix moth caterpillars and red spider and bryobia mites and will also control spider mites resistant to other materials. Promising results have been obtained against apple aphids, winter moth caterpillars, apple blossom weevil, apple and pear suckers and sawflies. It has not proved effective against big bud mite of black currants or strawberry mite but has controlled a number of glasshouse pests and pests on arable crops.—Baywood Chemicals Ltd.

4337. Holliday, R. F. W.
Malathion and its place in horticulture.
Pest Technol., 1960, **2**: 164-5, bibl. 1, illus.

Malathion may safely be applied to any crop at any time of year up to 7 days before harvest and is both an insecticide and an acaricide. It is compatible with most other spray materials and when sprayed on apples and pears will control aphids, sawfly, bryobia mite, leafhoppers, codling moth and red spider mite. It also gives effective control of cherry blackfly on cherries; leaf-curling and mealy plum aphids, sawfly, leafhoppers, bryobia mite and red spider mite on plums and damsons; aphids, capsids, red spider mite and sawfly caterpillars on currants; aphids, red spider mite and sawfly caterpillars on gooseberries; aphids and red spider mite on strawberries; and raspberry beetle, red spider mite, aphids and leafhoppers on raspberries, blackberries and loganberries. It is also effective against flower and vegetable pests. In most cases malathion 60% e.c. should be applied at 1½ pt./100 gal.

4338. Tew, R. P., and Sillibourne, J. M.
Harvest residues of malathion on soft fruits and apples.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 116-19, bibl. 3.

Lloyd George raspberries, sprayed with malathion emulsion at up to 0·1% active ingredient a week before harvest, were found to carry less than 1 p.p.m. malathion at harvest. Loganberries similarly sprayed twice, at 19 and 7 days before harvest, were found to have less than 0·5 p.p.m. at harvest. Cambridge Favourite strawberries, sprayed with 0·1% malathion were found to have less than 1 p.p.m. one week later. Rate of decay studies on loganberry, strawberry and apple show that the half-life of malathion is only 1½–2 days, and that applications at the rates recommended for control of codling moth on apple, even late in the season, are unlikely to leave residues exceeding 0·5 p.p.m. on fruits picked a week after spraying. [Authors' summary.]

4339. Pianka, M.
Mecarbam, a new multipurpose organophosphorus insecticide.
Chem. Ind., Lond., 1961, No. 10, p. 324.

Chemical and other characteristics are described. Mecarbam has been used for high volume spraying at 0·04–0·08%, and for medium volume at 400 g./ha. for ground crops and at 1 kg./ha. for fruit trees. Good control is reported of green apple aphid (*A. pomi*), red spider mites (*P. ulmi*, *T. telarius* and *B. praetiosa*) and San José scale (*Q. perniciosus*). Some control of codling moth (*E. pomonella*) on apples was obtained. Other pests against which it was effective were pear sucker (*P. pyri*), lace bug (*Stephanitis pyri*), olive fly (*D. oleae*), carrot fly (*P. rosae*) on celery, and various leafhoppers and mealy bugs.—Murphy Chem. Co. Ltd., St. Albans.

4340. Schaer, E., and Wildbolz, T.
Eine Bienenvergiftung durch Blattnektar von Kirschenblättern. **(Bee poisoning by nectar from cherry leaves.)**
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 180-2, illus.

Cherry leaves, visited by bees for nectar, were found to contain 21–23 p.p.m. of Rogor, and poisoned bees from 0·1 to 1·0 p.p.m. It is suggested that Rogor and other systemic insecticides should not be used on cherries.—Eidg. Versuchsanst., Wädenswil.

4341. Hey, G. L.
Sevin—a new carbamate insecticide.
Pest Technol., 1960, **2**: 180-2, illus.

See *H.A.*, 30: 5193.

4342. Osburn, M. R., Dawsey, L. H., and Woodham, D. W.
Insecticide residues on forage under sprayed pecan trees.
J. econ. Ent., 1960, **53**: 719-21, bibl. 3.

In a grazed pecan orchard toxaphene residues on forage were much higher and more persistent than those of Guthion, EPN or parathion. Parathion accumulated and persisted the least, and after 13 days' weathering they usually did not exceed 1 p.p.m.—Agric. Res. Serv., U.S.D.A.

4343. Hoyt, S. C.
Effect of urea on the control of some apple insects with certain insecticides.
J. econ. Ent., 1960, **53**: 685, bibl. 2.

Laboratory studies on the compatibility of DDT and urea have shown that urea or some impurity contained in it impaired the effectiveness of DDT in controlling codling moth on apples. In field trials with 2 lb. of 50% DDT w.p. per 100 gal. an average of 3·7% of the fruit was wormy and an additional 2·9% had stings. When 5 lb. of urea was added to the spray in the first two applications the corresponding figures were 6·9 and 4·5%. In similar field trials using Kelthane and Tedion against European red mite (*Panonychus ulmi*) and malathion against apple aphid (*Aphis pomi*) the addition of urea did not reduce the effectiveness of these materials.—Wash. agric. Exp. Stats, Pullman.

4344. Nordby, A.
Forsøk med tåkesprøyter i frukthager. **(Experiments with low volume sprayers in orchards.)** [English summary 1 p.]
Meld. norg. LandbrHøgsk., 1961, **40**(1): 1-40, bibl. 12, illus.

Solo knapsack sprayers gave effective scab control with concentrate sprays on trees up to 5 m. high, but coverage was not so satisfactory on trees 6 m.

high. A tractor-drawn low-volume sprayer (Sigvardt) with 4 air outlets gave a better coverage than comparable sprayers with one manually-operated air outlet, and satisfactorily treated trees 5–6 m. high. Under conditions where scab control was difficult, high-volume application gave results similar to those obtained with low-volume application by a knapsack sprayer to trees 5 m. high. It was shown that an effective propeller-agitator can maintain powdered sulphur in a homogeneous suspension in the tank.—LandbrTek. Inst., Vollebekk.

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE.

General.

(*See also* 3616, 3617, 3621, 3644, 3649, 3726, 3730-3734, 3742, 3749, 3766, 5575, 5576, 5578, 5579, 5584.)

4345. Keyworth, W. G.
The National Vegetable Research Station.
J. roy. agric. Soc., 1960, **121**: 87-101.

A review of recent work and results obtained at Wellesbourne in plant breeding, chemistry and physiology, irrigation studies, pests and diseases.

4346. Rogers, I. S.
Research in vegetables.
J. Agric. S. Aust., 1960, **64**: 194-7, illus.

Tomato selection and breeding work in South Australia is outlined. Polythene linings for glasshouses are being tested as means of obtaining some measure of frost control and higher day and night temperatures [see also *H.A.*, 31: 2579]. Two sprays of Metasystox or Rogor, applied to control lettuce spotted wilt, increased the number of healthy heads from 15 to 55%. Boron deficiency in celery responded to the application of borax (10–20 lb./acre).

4347. Kostelijk, S., and van Wely, A. J. M.
De groenteteelt onder glas in de periode 1950-1959. **(Vegetable growing under glass during 1950-1959.)** [English summary $\frac{1}{4}$ p.]
Meded. Dir. Tuinb., 1961, **24**: 33-43, 62, bibl. 2, illus.

The total area of vegetables under glass in Holland has almost doubled since 1950.

4348. Rincon, D. J., and Chicco R., J.
Introducción de hortalizas en los Valles de Aragua. **(Introduction of vegetables into the Aragua valleys.)**
Ingen. agron., 1960, No. 4, pp. 8-14, bibl. 10, illus.

Results of variety trials on 17 temperate and subtropical leaf, fruit, root and bulb vegetables in Venezuela.

4349. Nishi, S., and Hiraoka, T.
Studies on F_1 hybrids of vegetable crops. I. Studies on the utilization of male sterility in F_1 seed production. Part 1. Histological studies on the degenerative process of male sterility of some vegetable crops. [Japanese, with English summary $1\frac{1}{2}$ pp.]
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1958, No. 6, pp. 1-41, bibl. 55, illus.

In cabbage, Welsh onion, Japanese radish and tomato.

4350. Eguchi, T., Ōshika, Y., and Yamada, H.
Studies on the effect of maturity on longevity in vegetable seeds. [Japanese, with English summary $1\frac{2}{3}$ pp.]
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1958, No. 7, pp. 145-65, bibl. 21, illus.

The seeds of Welsh onion, cabbage, Japanese radish, Chinese cabbage, carrot, edible burdock, eggplant, cucumber, tomato and pumpkin were harvested at different stages of maturity, dried, stored at room temperature and tested for germination 2–3 years after harvest. Seed viability was best when the seeds were harvested at the correct stage of maturity, since germination capacity decreased in over-mature and immature seeds. When the seeds were sown at intervals throughout the year, germination decreased progressively from June to August as temperatures and humidity increased.

4351. Giraldi, G., and Serini, G.
La disinfestazione in atmosfere artificiali. **(Disinfestation in artificial atmospheres.)**
Progr. agric., Bologna, 1960, **6**: 1074-81, illus.

The paper is primarily concerned with the disinfestation of stored plant products. The exposure of pea seeds to 80 g. methyl bromide per cu. m. for 3 hours gave 99% control of *Bruchus pisorum* larvae and pupae without reducing their viability. Exposure of *Dolichos lablab* seeds to the same rate of methyl bromide for 1 and 3 hours gave complete control of *Callosobruchus phaseoli* adults without affecting viability adversely and demonstrated the growth-promoting capacity of bromide.—Osserv. Mal. Piante, Verona.

4352. Breccia, A., and Palloni, V.
L'utilizzazione delle radiazioni ionizzanti in agricoltura. **(The use of ionizing radiation in agriculture.)**
Sementi elette, 1960, **6**(4): 36-40, bibl. 6.

Irradiating the seeds of 2 types of French bean, fennel and S. Marzano tomatoes with 120 r. gave yield increases of 140, 44, 80 and 56%, respectively, when the seeds were sown a few days after treatment, and of 50, 30, 18 and 35%, respectively, when they were sown a year after treatment. The yields given by seeds of the 1st generation after irradiation were 92, 98, 90 and 101%, respectively, of those of the controls. Those given by 2nd generation seeds of the 2 bean types and fennel were 88, 97 and 86%, respectively, of the controls.

4353. Pálfi, G.
A termesztett növények csírázása szikes közegben. (**Seed germination of crop plants in saline media.**) [English and Russian summaries 1 p. each.]
Növénytermelés, 1960, **9**: 359-68, bibl. 30.

Among the plants investigated were peas, peppers, tomatoes and carrots. The effect of 0·1 strength Van't Hoff saline solution was mainly to delay germination, with only a slight reduction in the percentage of seeds germinating. Soaking the seeds for 24 hours in distilled water, tap water and the saline solution resulted in the release by the seeds of Na and K into the liquid, the released amount increasing in the order given except for pepper seeds. All the seeds named took up calcium from tap water and released it to the Van't Hoff solution.—Agric. Res. Inst., Szeged.

4354. Anon.
Densidad de siembra en semilleros. (**Sowing rates in seed-beds.**)
Not. agric. Serv. Shell Agric., Venezuela, 1960, **2**: 84, illus.

Trials at Cagua Experimental Station, Venezuela, in 1958/60 showed that the best sowing rates per sq. m. were 6 g. for eggplant, cauliflower and cabbage, 20 g. for onion, 2 g. for lettuce, 8 g. for sweet pepper and 5 g. for tomato.

4355. Nishi, S., and Kuriyama, T.
Studies on a method of vegetative propagation of vegetable crops. I.
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1958, No. 6, pp. 43-74, bibl. 33, illus.

To obtain clonal material for breeding purposes, plants of Japanese radish, turnip, Chinese cabbage and carrot were cut lengthwise through the centre into 4 pieces and various rooting treatments were applied. Uspulun disinfection was effective, except where the soil was heavily infected with pathogenic fungi. Drying, or curing, was more beneficial when carried out at higher temperatures (20–30° C.), when callus formation was promoted and rotting prevented. Sandy soil was best for rooting, but loamy soil was better for subsequent growth. Application of NAA inhibited rooting, and the partial division of plants before harvesting was not beneficial. A low soil temperature to prevent rotting was more important than a higher temperature to promote rooting.

4356. Nilssen, E.
Un nuovo metodo per la coltura degli ortaggi. (**A new method of growing vegetables.**)
Inf. Ortofruttic., 1960, **1**: 224-5, illus.

The history of the development of peat pots is outlined and their advantages for raising vegetable plants are discussed.

4357. Markus, D. K.
Early experiences with hydroponics at the Public Health Research laboratories.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 339-51, bibl. 9, illus.

Excellent crops of celery, swiss chard and cucumbers and good crops of french and lima beans, endive, lettuce, spinach, tomatoes, broccoli and cabbage have been obtained in hydroponic cultures. Pesticide-free crops are being produced by this method as controls for experimental work. Details are given of various nutrient solutions used and of yields obtained.

4358. Stolp, D. W.
Bodemvocht en groenteteelt op een hoge zandgrond. (**Soil moisture and vegetable growing on a light sandy soil.**) [English summary 6 pp.]
Versl. Landbouwk. Onderz. **66.16**, 1960, pp. 235, bibl. 250, illus.

Many vegetables and strawberries were grown in irrigated plots, and some were protected from natural rainfall. Yield reactions to the various moisture regimes were recorded and are represented logarithmically. In most experiments the yield reactions were similar, and drought sensitivity was high in most crops. In general, optimal yields on this soil were obtained with an average soil moisture content of about 12·5% by weight. Observations on the crops grown (root and tuber, leafy and fruiting vegetables) indicate that yield reactions depend on the type of crop and its root system, the season of cultivation and the length of time that the crop is in the ground. Sensitivity to the prevailing soil moisture conditions, as shown by some crops, was attributed to a halt in root development during a period of active growth above ground, which resulted in a lack of balance between absorption capacity and water requirement. Differences in yield were sometimes obtained at the same soil moisture content, and, conversely, similar yields were also sometimes obtained with different soil moisture contents; this is considered to be an effect of the soil moisture cycle. In terms of moisture tension (pF) the recommended moisture regime has a limit of 2·5, and at an average pF of 3 there were considerable reductions in yields. It is not yet known whether yields are determined by the average moisture content, the average moisture tension or the available moisture. The ratio between calculated water consumption (E_w), for periods when the soil is completely covered by the crop, and the potential evapotranspiration (E_t) was related to the corresponding average soil moisture content. There was a positive correlation, but it differed in value in different experiments.

4359. Verlaat, J. G.
Vruchtwisselingsproblemen in de vollegrondstuinbouw. (**Problems of crop rotation in outdoor vegetable growing.**) [English and German summaries ¾ and 1 p.]
Meded. Proefst. Groent. Volle Grond Ned., Alkmaar, **16**, 1960, pp. 40, illus.

Information on crop rotation was collected from horticultural advisers and the following points emerged: Soil insects are not generally a problem, owing to the use of chlorinated hydrocarbons; eelworms are a problem, which can only be solved satisfactorily by rotation with immune crops; the problem of soil viruses can only be solved by the use of immune varieties; cultural hygiene is of great importance. There were also indications that the potato is not always satisfactory as a crop preceding vegetables. Red cabbage was very satisfactory as a preceding crop, and cabbage can be grown in monoculture for 4 years. Onions were the most sensitive of 5 crops to rotation.

4360. Eguchi, T., and others.
Studies on the effect of nutrition on flower formation in vegetable crops. Flower bud differentiation and development in vegetable crops under different environmental and nutritional conditions. [Japanese, with English summary 2 pp.]
Bull. nat. Inst. Sci. Hiratsuka, Ser. E, 1958, No. 7, pp. 167-247, bibl. 49, illus.

A study was made of the effects of spacing and nutrients on flower formation and of fertilizer level on flower initiation in plants partially or fully induced by low temperature or photoperiod. Spacing affected flower initiation and development in eggplant and pepper. Flower initiation in cabbage and burdock depended on plant size, but in strawberry it was accelerated when growth was restricted by nutritional deficiencies. In tomato, eggplant and pepper N or P deficiency delayed flower initiation, and caused the formation of flower and leaf primordia to take place at higher nodes than normal, and flower buds to cease development at the stage of sepal, petal and stamen formation. The later the time of spring sowing of Japanese radish, the greater was the effect of fertilizer levels on flower formation. The fertilizer effect was greater on Indian mustard when it was grown under a critical day-length of 13 hours. These results show that nutrition as well as temperature and photoperiod govern flower formation. [See also *H.A.*, 29: 2422.]

4361. Verlaat, J. G.
Chemische onkruidbestrijding in de vollegronds groenteteelt. (**Chemical weed control in vegetable growing.**) [English and German summaries 1 p. each.]
Meded. Proefst. Groent. Volle Grond Ned., Alkmaar, **18**, 1961, pp. 80, bibl. 8, illus.

A practical handbook, with recommendations for specific crops.

4362. Ashton, F. M.
The major problem in vegetable crop production—weed control.
Proc. 12th Calif. Weed Conf., 1960, pp. 72-4.

Costs for hand weeding in a number of truck crops are quoted, and compared with those for equivalent chemical weed control, the latter being 10–25% cheaper.—Univ. Calif., Davis.—*Weed Abstr.*, **10**, No. 244.

4363. Hall, B. J.
Chemical weed control in vegetables. Commercial application of new techniques.
Agric. Gaz. N.S.W., 1960, **71**: 601-5, illus.

The large scale use of monuron for asparagus, and of CDEC for cabbage, cauliflower, beetroot and tomato, using a band spraying technique.

4364. Warren, G. F.
Use of pre-emergence herbicides for vegetables in the United States.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5, bibl. 3.

Weed problems in horticulture in the U.S.A. are reviewed briefly and compared with those in Great Britain. Pre-emergence herbicides in commercial use are briefly discussed and promising new herbicides mentioned.—*Weed Abstr.*, **10**, No. 52.

4365. Gleason, L. S.
"Randox T", a new broad spectrum pre-emergence herbicide.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, pp. 54-5.

Randox T, a 3·0 : 7·5 mixture of CDAA and trichlorobenzyl chloride, has shown promise in onions, peas, carrots and lima and pole beans.—Monsanto Chem. Co., St. Louis, Mo.—From *Weed Abstr.*, **9**, No. 1922.

4366. Miller, R. A.
Pre-emergence on eight vegetable crops with several herbicides.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, p. 46.

An evaluation of 8 herbicides at various rates for pre-emergence weed control in tomatoes, cabbage, onions, carrots, beets, peas, snap beans and sweet corn.—For details see *Weed Abstr.*, **9**, No. 1918.

4367. Roberts, H. A., and Wilson, B. J.
The response of vegetable crops to pre-emergence applications of some substituted triazines.
Proc. 5th Brit. Weed Control Conf. 1960, pp. 4, bibl. 1.

Results are given of 3 field trials in 1959, in which simazine, atrazine, trietazine and propazine at rates of 0·25, 0·5 and 1 lb./100 gal./acre were applied immediately after sowing 12 vegetable crops on a sandy loam soil low in organic matter. —Nat. Veg. Res. Stat., Wellesbourne, Warwick. —For details see *Weed Abstr.*, **10**, No. 55.

4368. Hall, B. J.
Experiences with three new herbicides (CDAA, CDEC, EPTC).
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 59, pp. 8.

In a time-of-spraying experiment, in which CDAA at 3 lb./acre was applied pre-emergence to Prizetaker onions under ideal moisture conditions, early spraying (2 days after sowing) resulted in the highest onion emergence but the lowest survival rate and the highest weed numbers 2·5 months later. There was little difference in onion germination or weed counts from spraying 6, 10 or 14 days after sowing. CDEC at 6 lb./acre pre-emergence has been consistently used in vegetable growing without injury to beetroot, tomatoes, cabbages, cauliflowers, onions, lettuces, carrots, parsnips, cucumbers, pumpkins, squash, peas, beans or seedling asparagus. In pre-emergence trials EPTC (incorporated liquid or granular) caused serious yield reductions in cucumbers and rock melons at 5 lb./acre and in gladiolus at 10 lb./acre. In one trial EPTC caused a taint in beetroot. In post-emergence trials 10 lb./acre EPTC (incorporated liquid or granular) caused no apparent injury to budded trifoliate orange stocks, seedling peach stocks, grape vines or roses.—Hawkesbury agric. Coll., Richmond, N.S.W.—From *Weed Abstr.*, **10**, No. 246.

4369. Orsenigo, J. R.
Weed control investigations in vegetable crops.
A.R. Fla agric. Exp. Stats, 1958-59, p. 270.

In a celery seed-bed fumigation with methyl bromide and "Kil-drench No. 4" provided satisfactory weed control without any adverse effect on the seedlings. Niagara-4562 post-emergence gave outstanding weed control without injuring celery. Emergence and development of Florida Giant peppers were normal under all combinations of CDAA or CDEC with no fertilization, fertilizer banded over the drill, rain or supplementary irrigation. In pre-emergence trials with CDAA and CDEC in lettuce, two forms of endive, romaine [cos lettuce] and Chinese cabbage only romaine was injured by CDEC, whereas all crops except the Chinese cabbage were severely stunted by CDAA.

4370. van Staalduine, D.
Onkruidbestrijding met chloor-IPC in de groenteteelt. **(Weed control with chlorpropham in vegetable crops.)**
Groenten en Fruit, 1959, **14**: 1079, 1103.

The mode of action of chlorpropham and the sensitivity to it of crops and weeds are reviewed, together with the effect of soil type, crop, rainfall, temperature, time of application and tillage on its effectiveness. Practical recommendations are given for the use of chlorpropham, and, in some cases, of herbicidal oils, sulphuric acid and PCP, to control weeds in endive, lettuce, chicory, scorzonera, beans, carrots, leeks and asparagus. In trials with carrots on a sandy clay soil PCP at 8 or 16 kg./ha. (20 or 40 l. of 40% PCP in oil/ha.) plus chlorpropham at 1 or 2 kg./ha. in 100 l. spray volume gave good weed control and increased yields by 20 to 30% compared with one weeding.—From *Weed Abstr.*, **9**, No. 1920.

4371. Wright, J. M., and Chapman, R. K.
1961 insect control: vegetable crops.
Circ. Wis. agric. Ext. Serv. **520B**, revised 1961, pp. 12.

Spray programmes arranged by crops and based on results of research.

4372. Lall, B. S., and Ansari, M. N. A.
Field studies on the root-knot nematodes (*Meloidogyne* spp.) Nematoda Heteroderidae.
Sci. and Cult., 1960, **26**: 279-81, bibl. 11, illus.

The degree of infestation and species of *Meloidogyne* involved were investigated in 6 places and on 9 common vegetables, including beans, radishes, cucurbits and solanaceous plants.—Bihar agric. Coll., Sabour.

4373. Ministry of Agriculture, London.
Red spider mite on glasshouse crops.
Adv. Leafl. Minist. Agric., Lond., **224**, revised 1960, pp. 8, illus.

Life history and control of *Tetranychus telarius* on vegetable and flower crops.

4374. Calderbank, A., Edgar, E. C., and Silk, J. A.
Triazinyl thiophosphate esters with selective aphicidal properties.
Chem. Ind., Lond., 1961, No. 19, pp. 630-1.

The properties of menazon (*S*-(4,6-diamino-1,3,5-triazin-2-ylmethyl)0,0-dimethyl phosphorothiolothionate), a new persistent systemic aphicide, are described. In laboratory tests it was effective against *Aphis fabae* and *Macrosiphum pisi* on broad bean, *A. gossypii* on cucumber, *Myzus persicae* on radish and *Brevicoryne brassicae* on cabbage. It may be used as a spray, as a soil drench or as a seed dressing. It has low mammalian toxicity and, against *M. pisi*, had 5 times the toxicity of parathion.—Jealott's Hill Res. Stat., Bracknell, Berks.

4375. Dent, R. G.
The brown vegetable weevil.
J. Dep. Agric. S. Aust., 1961, **64**: 388-9, illus.

Control measures against *Listroderes costirostris obliquus* on a range of vegetables, using DDT as a 0·1% spray or 2% dust.

4376. Kopvillem, H. G.
Nectar plants for the attraction of entomophagous insects. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(5): 33-4.

Investigations in 1957–59 showed that many umbelliferous plants and also onion seed plants possess a particular attraction to several parasites of vegetable pests. *Ernestia consobrina* and *Exetastes cinctipes* (parasites of the cabbage cutworm), *Gonia capitata* and *Banhus falcatorius* (parasites of turnip moth), *Linnaemyia vulpina* and many others were found feeding on umbelliferous plants from June to September. When small plots of these host plants were established near vegetable fields, the ratio of the areas being about 1 : 400, cabbage cutworm larvae were parasitized up to 94%. Caraway, parsnip and parsley as well as wild umbelliferous plants are recommended for planting to attract the parasites.

4377. Muns, R. P., Stone, M. W., and Foley, F.
Residues in vegetable crops following soil applications of insecticides.
J. econ. Ent., 1960, **53**: 832-4, bibl. 9.

Of 15 vegetables grown in soil treated with 10 lb. chlordane per acre, only sweet potato, carrot and swede had residues in excess of 0·3 p.p.m. Of 12 grown in soil treated with 20 lb. DDT per acre, only potato, bell pepper and table-beet had residues. Of 8 crops grown in soil treated with 42 lb. ethylene dibromide per acre, table-beet, onion, turnip, sugar-beet and lima bean straw showed residues of 9 to 76 p.p.m. Radishes grown in soil treated with 4 lb. aldrin per acre contained no aldrin but 0·24 p.p.m. dieldrin; no residue was detected from the same dosage of dieldrin. Table-beets grown in soil treated with 3 lb. toxaphene per acre showed a residue of 0·4 p.p.m. or less. [From authors' abstract.]—Agric. Res. Serv., U.S.D.A.

4378. Singh, K., and Thompson, B. D.
Determination of amino acids and sugars from seedlings of vegetable varieties by paper chromatography.
Indian J. Hort., 1960, **17**: 122-8, bibl. 19, illus.

Eight amino acids and 5 sugars were isolated from watermelon, 8 amino acids and 4 sugars from cucumber, and 10 amino acids and 3 sugars from bean varieties.—Univ. Fla, Gainesville.

4379. Holmes, E. S., and Halsey, L. H.
Mechanical equipment as an aid to the harvesting and handling of cabbage, cucumbers, tomatoes and other vegetables handled in a similar manner.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 43-5, illus., and 175-6.

Notes on the efficiency of mechanical harvesting equipment for cabbages, cucumbers, tomatoes, beans and peas. [See also *H.A.*, 31: 612 and 2364.]

4380. Anon.
Vegetable washers—and how to choose one.
Fm Mechaniz., 1960, **12**: 362, illus.

Machines described include the Edmonds vegetable spray washer for washing celery, spring onions, lettuces, radishes and leeks individually or in boxes with an hourly output of 1,000 sticks of celery or 100 bushel boxes of spring onions. The Cooch celery washer also washes 1,000 sticks per hour. The Don hand-operated washer is designed to handle ½-cwt. batches of roots or 40 lb. of other vegetables at a time. Water consumption and prices are given for each machine.

Artichokes.

(*See also* 3728.)

4381. Barbieri, R.
Osservazioni sulla biologia del carciofo Spinoso sardo (*Cynara cardunculus* L. β *scolymus* L.). **(Observations on the biology of the globe artichoke variety Sardinian Spiny (*Cynara cardunculus* var. *scolymus*.).**
Studi Sassaresi, Sez. III, 1959 (issued 1960), **7**: 19-36, bibl. 15, illus.

The early variety Spinoso sardo (Sardinian Spiny) and the still earlier and less exacting spineless variety Masedu are described, with notes on their cultivation. Propagation from "ovoli" (buds, usually terminal) results in earlier harvesting than if basal shoots are used, but is only practicable where irrigation can be applied.—Ist. Agron. gen. Colt. erb., Univ. Sassari.

4382. Mehani, S.
Essai de traitement contre le blanc des artichauts (*Leivellula taurica*) Arnaud. (*Oïdiopsis taurica*) Salm. **(An experiment on the control of artichoke mildew (*Leivellula* (*Oidiopsis*) *taurica*).)**
Rapp. Activ. Exp. Déf. Cult. 1959, No. 4, pp. 75-82.

Karathane at 70 or 90 g./hl. gave moderately good control of the mildew on globe artichoke plants in Tunisia. High-pressure spray equipment was necessary to ensure covering the lower surfaces of the leaves. Resistance to the disease was favoured by good drainage, light and protection from cold winds. The leaves are not susceptible until approximately the end of their active growth period, when protective treatment is advisable.

Asparagus.

(*See also* 5065.)

4383. van Dam, J. G. C., and Hulshof, J. A.
Zijn de lichtste zandgronden de geschiktste aspergegronden? **(Are the lighest sandy soils the best asparagus soils?)** [English summary ¼ p.]
Meded. Dir. Tuinb., 1961, **24**: 54-5, 63, bibl. 3.

The light sandy soils frequently used in Holland for asparagus often give a much lower yield than can be obtained on heavier soils. The soil requirements of asparagus are: a deeply-aerated profile with the water table not less than 1 m. from the surface, a light fairly acid, top-soil and an adequate water supply. Soil types suitable for asparagus growing are classified.—Sticht. Bodemkart., Bennekom.

4384. Carolus, R. L., and Brown, L. D.
We've been overfeeding asparagus.
Amer. Veg. Gr, 1961, **9**(3): 9, 52-3, illus.
Carolus, R. L.
Mature asparagus plantings need less fertiliser than is often thought.
Comm. Gr, 1961, No. 3404, pp. 767-9, illus.

The quantity of labelled P recovered from harvested asparagus spears was less than 3% of that applied in the fertilizer. On 40 farms, using a wide range of NPK applications, neither the yield nor the mineral composition of the spears was related to the rates of fertilizer application. An asparagus plantation yielding 55 cwt. of spears per acre is calculated to use 23 lb. of K_2O per acre. Suggested rates of fertilizer application for asparagus are given.—Mich. St. Univ.

4385. Herregods, M.
De bewaring van asperges. **(Asparagus storage.)**
Tuinbouwberichten, 1961, **25**: 48-50, bibl. 1, illus.

Asparagus spears, stored at 2° C. in open boxes, became shrivelled after about a week. When stored in closed bags of 0·1 or 0·05 mm. polythene, the spears were still fresh and firm after 27 days at 1·9° C. Storage by immersing the spears in water encountered difficulties with bacterial rotting, shrivelling (in water with too high a salt concentration) and discoloration by iron salts.

4386. Barger, W. R., and others.
California asparagus—effect of transit environments on market quality. I. Temperature, relative humidity, and atmosphere composition in rail cars.
Lipton, W. J.
Idem. II. Effect of atmosphere composition on quality.
Mktg Res. Rep. U.S. Dep. Agric. **428**, 1960, pp. 26, bibl. 12, illus.

The temperature, R.H. and atmospheric composition during the transport of asparagus by rail was observed in a conventional ice-bunker refrigerator car, an ice-bunker car with diesel fans and thermostat, and 3 types of mechanically refrigerated car. After hydrocooling the temperature of the asparagus was 37° F. and was maintained at 34–39° during transit. The R.H. in all cars was satisfactory for asparagus throughout transit, and excess accumulation of CO_2 and depletion of O_2 did not occur. Laboratory tests showed that modification of the atmosphere to 10% or less CO_2 combined with 10% or more O_2 at 37·5° F. reduced the incidence of soft rot and the degree of toughening, but at 50° the asparagus respired faster and was in danger of "smothering".

Brassicas.

(*See also* 3710, 3739, 3748, 3778, 3792, 3822, 4735, 5585, 5592.)

4387. Röbbelen, G.
Über die Kreuzungsunverträglichkeit verschiedener *Brassica*-Arten als Folge eines gehemmten Pollenschlauchwachstums. **(Incompatibility among different species of *Brassica* resulting from the inhibition of pollen tube growth.)** [English summary ¼ p.]
Züchter, 1960, **30**: 300-12, bibl. 81, illus.

In crosses made in all possible combinations between *Brassica oleracea*, *B. nigra*, *B. campestris*, *B. carinata*, *B. juncea* and *B. napus*.

4388. Valenta, M., and Kutaček, M.
The effect of light and temperature on the biosynthesis of indole-type ascorbigen. [Russian.]
Fiziol. Rast., 1960, **7**: 607-9, bibl. 16.

Experiments with brassicas have shown that ascorbigen is synthesized most intensively in young leaves and stem apices. Young kohl-rabi plants held in darkness at 2° C. had an initial ascorbigen content of 2·8 mg. %; when the temperature was raised to 20° C. it increased to 16·2 mg. % and when the plants were exposed to full sunlight at 20° C. it reached 31·4 mg. %. The optimum temperature for synthesis was 22° C. Pure ascorbigen was more stable as a solid than in solution.

4389. Ehrendorfer, K.
Vitamin C in Kohlsprossen (*Brassica oleracea* var. *gemmifera* D.C.). Ein Beitrag zur Frage der Vitamin C-Verluste beim Kochen. **(Vitamin C in brussels sprouts. A study of the problem of vitamin C loss on cooking.)** [English summary 7 lines.]
Bodenkultur, 1960, **11**: 321-31, bibl. 19.

Brussels sprouts contained 100–150 mg. vitamin C per 100 g. During storage at 40° C. 20–25% was lost in 4 weeks.

4390. (Larson, R. H., and Walker, J. C.)
First cabbage to resist clubroot.
Agric. Res., Wash., 1961, **9**(8): 15-16.

Badger Shipper is resistant to the strains of clubroot which are most prevalent in the U.S.A. Heads of this variety are the same size as those of Badger Ballhead and are ready for harvesting at the same time as Globe.—Wis. agric. Exp. Stat.

4391. Kružilin, A. S., and Švedskaja, Z. M.
Differentiation of buds of white-headed cabbage during vernalization. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1960, **130**: 227-30, bibl. 11, illus.

Based on the morphology of the apex the differentiation of flower buds is divided into 4 stages which are illustrated with photomicrographs. With an early ripening variety the necessary duration of vernalization (at 2–3° C.) for 2-month-old seedlings was 50–60 days and for headed plants 20–25 days. With a later ripening variety the corresponding periods were 3 months and 60–70 days, respectively.

4392. Trebušenko, P. D.
Degeneration of the apex in the cabbage. [Russian.]
Bot. Žurnal, 1960, **45**: 1657-66, bibl. 2, illus.

Degeneration of the apex in cabbage, resulting in failure to form a head, is a common occurrence near the Arctic Circle at 66° N.L. The early symptoms are described and illustrated, and the results are given of work on its prevention. Several varieties were sown either in early or late April, the seedlings were pricked out into frames and given 4 different treatments for 27 or 20 days as follows: (1) temperature below 12° C., natural day length, (2) temperature above 12° C., 10-hour day length from 3 a.m. to 1 p.m., (3) as (2) but from 7 a.m. to 5 p.m., (4) as (2) but from 1 to 11 p.m. The seedlings were subsequently hardened off and planted out on 10–11 June. Failure to form heads was most frequent under (4) when the light admitted was rich in long-wave rays and under (1) with the low-temperature, long-day treatment. Treatments (2) and (3) produced few headless plants [see also *H.A.*, 29: 2442]. Head formation was also improved by the early sowing date and by wider spacing in the frames. It was also observed that the weather during planting out affected heading, high temperatures, clear skies and low humidity being favourable to it. Apical degeneration was not confined to the far north but occurred as far south as latitude 45° N.

4393. Dorohov, A. A.
The capacity for shoot formation by the roots of cabbage. [Russian.]
Bot. Žurnal, 1961, **46**: 133-4, illus.

Shoots developed from the roots of direct seeded cabbages but not from the roots of transplanted cabbages.

4394. Poerink, H. J.
Rand in witte kool. **(Tip-burn in white cabbage.)** [English and German summaries 1 p. each.]
Meded. Proefst. Groent. Volle Grond Ned., Alkmaar, **19**, 1961, pp. 63, bibl. 26, illus.

Comparative trials indicate that significant differences in tip-burn susceptibility exist between varieties and even between strains of one variety. Leaf analyses of affected cabbages showed higher levels of N, P and K, but lower Ca levels, than in normal cabbages. K/Ca ratios in affected heads were often greater than those in normal heads from the same field. Fertilizer trials showed that high applications of N or ditch dredgings can increase tip-burn. Applications of Ca, Mg, K, B, Cu, Mn, Mo, Fe or Zn had no effect on tip-burn. The effect of time of sowing was variable, but late harvesting increased the incidence of tip-burn. The incidence of tip-burn was high on soils encouraging vigorous growth. Wide spacing also increased tip-burn, and produced a higher average weight of heads, but yield per ha. decreased in comparison with closer planting. Temporary storage of early white cabbages after harvesting increased the percentage of internal tip-burn. In late cabbages tip-burn increased as the storage temperature increased.

4395. Kennelly, A. G.
Cauliflowers and broccoli.
N.Z. J. Agric., 1961, **102**: 39-47, illus.

Including notes on pests and diseases, and varieties grown in various parts of New Zealand.

4396. Salter, P. J.
Effects of different soil moisture conditions during the seedling stage on the growth and yield of early summer cauliflowers.
J. hort. Sci., 1960, **35**: 239-48, bibl. 11, illus.

In the 2 treatments, applied to potted plants in cold frames from October until planting time in March, frequent watering so as to maintain soil moisture at or near field capacity was compared with a dry regime in which plants were watered only when they began to wilt. After planting in the field, wet and dry treatments were given, both to plants which had been grown in wet conditions in the frames and to those which had been grown under dry conditions. Similar experiments were carried out during 3 successive seasons. The wet treatment applied in the early stages of growth resulted in increased yield at harvest, increase in final leaf number per plant and a slight delay in maturity compared with the dry treatment. Irrigation in the field resulted in increased yields in 2 out of 3 years. [Author's summary.]—Nat. Veg. Res. Stat., Wellesbourne.

4397. Peterson, N. K., and Purvis, E. R.
Development of molybdenum deficiency symptoms in certain crop plants.
Proc. Soil Sci. Soc. Amer., 1961, **25**: 111-17, bibl. 14, illus.

Techniques for producing Mo-deficiency symptoms in experimental plants are discussed. Seeds of cauliflower, broccoli and tobacco were germinated in pyrex glass sand and transferred to a pyrex glass cullet-wool mixture. Cauliflower seedlings, supplied with a Mo-free nutrient solution, showed Mo-deficiency symptoms from the 4th week onwards. A later analysis showed 0·16 p.p.m. of Mo in the older leaves, and 0·07 p.p.m. in the younger leaves, of plants severely affected by "whiptail". Broccoli grown in pyrex glass sand with the same solution showed Mo-deficiency symptoms 3 weeks after germination. Tobacco seedlings in the pyrex glass cullet-wool mixture responded to the absence of Mo from the 4th week by wilting in the afternoons, developing pale upper leaves and some leaf-marginal necrosis. Subsequently the chlorosis increased and the leaf tissues bulged between the veins. The plants were shorter and produced fewer seed pods than the controls. Lack of Mo increased leaf respiration. —Agric. Exp. Stat., Rutgers Univ.

4398. Anon.
Mobile broccoli platform increases output by 20 per cent.
Comm. Gr, 1961, No. 3407, p. 947, illus.
Grower designs mobile packing table for cauliflowers.
Grower, 1961, **55**: 808, illus.

The cut cauliflower heads are placed onto a U-shaped platform fitted around a tractor, and are there graded and packed in boxes.

4399. Shimizo, S., Kanazawa, K., and Kobayashi, T.
Studies on the breeding of Chinese cabbage for resistance to soft rot. Part 1. Differences in resistance among varieties under field conditions. Part 2. Resistance in *Brassica* spp. under field conditions. [Japanese, with English summaries 1¼ and 1½ pp.]
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1958, No. 6, pp. 75-108, bibl. 17, illus., and 1960, No. 8, pp. 1-47, bibl. 10, illus.

In the first part the development of the pathogens *Erwinia aroideae* and *E. carotovora* is described in relation to season and temperature. Among 65 varieties of *B. pekinensis* 4 were resistant and 20 partly resistant. The second paper discusses the resistance of 13 *Brassica* spp. and their genetics in relation to the disease.

4400. Eguchi, T., and others.
Studies on seed production in Chinese cabbage (*Brassica pekinensis* Rupr.). Part 1. On flower bud differentiation in Chinese cabbage. Part 2. Influence of the time of nitrogenous fertilizer application on seed production in Chinese cabbage.
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1960, No. 8, pp. 49-58, bibl. 10 and 59-75, bibl. 17, illus.

The later the sowing date, the longer was the period required for terminal flower bud differentiation and the lower was the number of leaves formed. Axillary flower bud differentiation took place about 20 days later, the buds nearest the terminals developing earlier than those lower down; secondary axillary buds developed about 20 days after the primary axillary buds. Trials in which N fertilizer was applied at flower bud differentiation, at bolting and at flowering showed that additional N between flower bud differentiation and bolting stimulated the development of lateral branches, and between bolting and flowering resulted in a longer flowering period and higher percentages of pod setting and of large seeds. Application of N near to time of bolting is recommended for seed production.

4401. Takano, T., Tarui, M., and Hamashima, N.
Studies on the minor elements of vegetable crops. I. Effects and amounts of borax supply on Chinese cabbages and cauliflower. [Japanese, with English summary 1 p.]
Bull. Nagano hort. Exp. Stat., 1960, No. 2, pp. 1-19, bibl. 24, illus.

Applications of borax at 100, 200 and 300 g./are increased growth and yields and reduced B deficiency symptoms; applications of 100–200 g. were the most effective.

4402. Hori, Y., and others.
Calcium nutrition of vegetable crops. II. Calcium deficiency symptoms of Chinese cabbage and the effect of the composition and salt concentration of the culture solution on its occurrence. [Japanese, with English summary ¾ p.]
J. hort. Ass. Japan, 1960, **29**: 169-80, bibl. 8, illus.

Absorption of Ca by the plant was decreased by low Ca concentrations and high salt concentrations of the medium and by the use of NH_4 as part of the N source. The Ca content of the head leaves was low even in the normal plant, which may have a high Ca content in the lower green leaves. If Ca deficiency occurs before heading, the margins of the leaves have a water-soaked transluscent appearance and finally wilt and collapse. Where Ca deficiency occurs after heading, it causes heart rot, and this, unlike the deficiency occurring earlier, cannot be prevented by foliar sprays of Ca. [For part I, see *H.A.*, 30: 5337.]

4403. Conroy, R. J.
Control cauliflower diseases.
Agric. Gaz. N.S.W., 1960, **71**: 462-8, illus.

Control measures against common diseases, to be taken before the seedlings are transplanted into the field, include seed disinfection by steeping in water at 122° F. for 18 min. or dipping in corrosive sublimate (1 : 1,000) for 30 min., and sterilization of the seed-bed with Formalin or methyl bromide.

Treatments in the seed-bed and at transplanting and care in the field before transplanting are also discussed.

4404. Knösel, D.
Eine an Kohl blattfleckenerzeugende Varietas von *Xanthomonas campestris* (Pammel) Dowson. **(A variety of *Xanthomonas campestris* causing a leaf spot infection of cabbages.)** [English summary 14 lines.]
Z. PflKrankh., 1961, **68**: 1-6, bibl. 4, illus.
Strains attacking cabbages and cauliflowers.

4405. Reinmuth, E., and Seidel, D.
Der Einfluss organischer Düngung auf den Befall von Keimpflanzen durch *Pythium debaryanum* Hesse und *Rhizoctonia solani* Kühn. **(The influence of organic fertilizers on the attack of seedlings by *Pythium debaryanum* and *Rhizoctonia solani*.)**
Naturwissenschaften, 1961, **48**: 227, bibl. 5.
Infection of swede seedlings by both fungi was somewhat less in soil supplied with F.Y.M. than in soil supplied with mineral fertilizer.

4406. Seaman, W. L.
Variability in pathogenicity among isolates of *Plasmodiophora brassicae*.
Diss. Abstr., 1960, **21**: 1326, being *L.C. Card No. Mic.* 60-5788 of 69 pp.
The occasional occurrence of clubbing in plants of the clubroot-resistant cabbage variety Badger Shipper was found to be associated with the build-up in naturally infested soils of a variant of *Plasmodiophora brassicae* which was highly virulent to plants of this variety.—Univ. Wis.

4407. van 't Sant, L. E., Vijzelman, H. E., and Bethe, J. G. C.
Levenswijze en bestrijding van de galboorsnuitkever. **(Life history and control of the turnip gall weevil.)** [English summary 17 lines.]
Meded. Dir. Tuinb., 1961, **24**: 27-32, 62, bibl. 7, illus.
Two strains of *Ceuthorrhynchus pleurostigma* are found in the Netherlands; the spring strain overwinters as an adult, while the summer strain overwinters as a larva. For control young brassica plants should be dipped in a solution of parathion or demeton before planting out. In the field the weevil may be controlled by a collar application of chlordane or aldrin at 3 g. per plant. The cabbage root fly is also controlled by this treatment.—Proefst. Groent. Volle Grond, Alkmaar.

4408. Beloborodova, L. N.
An economical method of applying BHC against the cabbage maggot. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(3): 39.
The cabbage maggot [*Hylemyia brassicae*] causes a 25–30% decrease in cabbage yield in Yakutia. When 2 g. BHC was mixed with 1 kg. of the soil and humus mixture used for preparation of the nutrient blocks, the infestation was only 2·7% compared with 30·2% in plants grown in untreated blocks. BHC proved not only prophylactic but had a stimulating effect on growth, and the flavour of the cabbage was unaffected. This method proved much more economical than the 2–3 sprayings previously used.

4409. Read, D. C.
Effect of soil treatments of heptachlor and parathion on predators and parasites of root maggots attacking rutabagas on Prince Edward Island.
J. econ. Ent., 1960, **53**: 932-5, bibl. 12.
Heptachlor placed in 6-in. bands along both sides of rows of swedes reduced pupal parasitism of the cabbage maggot (*Hylemyia brassicae*) by *Aleochara bilineata* by more than 80%. At harvest more than twice as many root maggot pupae, and only one quarter of the number of parasites, survived in the treated compared with the untreated rows. A similar treatment with parathion reduced parasitism by 23% and caused no apparent reduction in root maggot populations. When applied in a 5-in. band just below the soil surface in a ridged row both insecticides gave highly significant control of root maggots [see also *H.A.*, 31: 2383].—Canada Dep. Agric., Charlottetown.

4410. Champ, B. R.
Cabbage pest control investigations, 1954.
Qd J. agric. Sci., 1960, **17**: 59-65, illus.
The best replacement for BHC/DDT dust for the control of several pests (notably *Pieris rapae*, *Plutella maculipennis* and *Liriomyza cruciferarum*) was found to be endrin e.c. applied as a spray at a concentration of 0·025% active ingredient at fortnightly intervals from transplanting.

4411. Leskova, A. T.
A bacterial preparation against cabbage pests. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(6): 31-2.
A bacterial preparation was made from the spores of *Bacillus cereus* var. *galleriae* and potato starch, 1 g. of the preparation containing 90 million spores. When this was used against the diamond back moth [*Plutella maculipennis*], the population of the pest was reduced. When a 1% suspension of the same preparation was used against the cabbage butterfly [*Pieris brassicae*], 100% mortality of the larvae was achieved in 4 days. When the eggs of *P. brassicae* were sprayed 1–3 days before hatching, all the larvae hatched but died soon afterwards.

4412. Kot, J.
Experiments on the use of *Trichogramma evanescens* Westw. in pest control of the vegetable garden pests *Plutella maculipennis* Curt., *Pieris brassicae* L. and *Pieris rapae* L. [In Polish.]
Ekol. Polska, Ser. B, 1959, **5**: 83-8, from abstr., in *Z. PflKrankh.*, 1961, **68**: 54.

Trichogramma reduced the numbers of diamond back moth larvae on cabbage by 53–81% in comparison with controls, and raised the mortality of cabbage white larvae to 75%. The density of trichogrammids released was 4,000–5,000 for every 500–600 sq. m.

4413. Džolova, N. G.
***Aretia flavia*, a pest on vegetable seedlings in the Irkutsk region.** [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(1): 50.

The fourth- and fifth-instar larvae of *A. flavia* proved very injurious to cabbage and cucumber seedlings in 1956–57. One larva can kill up to 4 seedlings at the 3–4-leaf stage. The young larvae feed on wild plants and the life cycle of the pest lasts 2 years. Dusting the seedlings and the soil round the hot-beds with BHC gave good protection against the pest.

4414. Semenov, A. E.
***Colaphellus alpinus* Gebl.** [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(3): 56.

A pest of crucifers, including radish, turnip and cabbage, in the Far North, controlled by DDT or BHC dusts.

Celery and celeriac.

(*See also* 4339, 4346, 4526.)

4415. Allen, A. G.
Celery production in Tasmania.
Tasm. J. Agric., 1961, **32**: 60-2, bibl. 2.

Advice on growing the crop.

4416. Quagliotti, L.
Problemi attuali nel miglioramento genetico del sedano (*Apium graveolens* L.) in Piemonte. **(Current problems in breeding and selecting celery in Piedmont.)**
Sementi elette, 1960, **6**(6): 26-31, bibl. 27, illus.

A review, briefly covering the effects of photoperiod and thermoperiod on flower induction; recent work on selection for high yield, smooth leafstalks, resistance to drought, machine handling and diseases; and a hybridization technique using house flies as pollinating agents.

4417. Johnson, K. E. E., Davis, J. F., and Benne, E. J.
Occurrence and control of magnesium-deficiency symptoms in some common varieties of celery.
Soil Sci., 1961, **91**: 203-7, bibl. 4.

In a 2-year study to determine the basic nutritional causes of Mg deficiency in certain varieties of green celery grown on organic soils in Michigan, plants grown at 4 different locations received various amounts of magnesium sulphate, which were applied either to the soil or directly to the plants as foliar sprays. The foliar sprays were more effective in controlling deficiency symptoms than the soil treatments. Higher Mg contents were in most cases accompanied by lower amounts of Ca and K than were lower Mg contents. Crop composition was found to vary with changes in crop root environment, above-ground environment and stage of maturity at harvesting. In different years there were also differences in the minimum Mg content at which the control of the deficiency occurred. [From authors' summary.]—Agric. Exp. Stat., Mich. St. Univ.

4418. Hall, C. B., and others.
Evaluation of factors determining celery quality.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 115-16, and 275.

Although there was no difference in the appearance, dry weight or chlorophyll, K and Na contents of celery sprayed with GA, a taste panel considered celery receiving applications of 20 or 40 p.p.m. to be of poorer flavour and tougher than the untreated samples or than those receiving only 10 p.p.m. GA. To determine the optimum harvest date for 3 varieties, celery was lifted at weekly intervals beginning 70 days and ending 119 days from transplanting. There were significant yield increases from the 70th to 77th day and from the 84th to 91st day. At the 98th day and subsequent harvests significant losses in yield occurred and the appearance of the crop seemed also to deteriorate.

4419. Anon.
Celery harvester speeds cutting and gives quality sample.
Comm. Gr, 1961, No. 3403, p. 721.

This single-row p.t.o.-operated machine allows the crop to be lifted, stripped and boxed all in one operation. Two discs mounted on the front of the tractor plough the soil away from around the roots. An adjustable angled blade then lifts the plants, trimming the roots at the same time. The plants then pass up an elevator onto a conveyor where the heads are manually stripped and boxed. An output of 200 boxes per hour with 16 heads per box is possible.

4420. Hämäläinen, A.
Kokemuksia sellerin viljelystä. **(Experience with celeriac.)**
Puutarha, 1960, **63**: 590-1, illus.

In Finland celeriac must be started under glass in March and then transplanted. The best method of storage is in pits, the roots being mixed with sand, and covered with 30 cm. of straw.—Viik exp. Fm.

4421. Blondin, P.
La preuve par neuf du rôle des écartements du céleri-rave. **(Experiments on the spacing of celeriac.)**
Rev. hort. suisse, 1961, **34**: 23-4.

In a trial with 3 celeriac varieties a spacing of 60 × 25 cm. produced heavier roots than spacings of 60 × 22·5 cm. and 60 × 20 cm., but such little difference as there was in yield per are was in favour of the closer spacing. [See also *H.A.*, 30: 2174.]

Cucurbits.

(*See also* 3621, 3646, 3651, 3674, 3697, 3708, 3719, 3720, 3735, 3757, 3760, 3792, 3807, 4378, 4413, 4473, 4475, 4502, 4639, 4641, 4656, 4666, 4690, 5166, 5561, 5569.)

4422. van Wyk, J. F.
Seed production of vine crops [cucurbits].
Fmg S. Afr., 1961, **36**(11): 52-4, illus.

Advice on pumpkins, squash, melons and cucumbers, with useful tables of varieties and seed yields.

4423. Hall, B. J.
Weed control in cucumbers, pumpkins and rock melons.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 22, pp. 7.

Cucumbers. In pre-emergence trials during 2 years CDEC and amitrole gave excellent weed control, increased yields and are each recommended at 6 lb./acre. Although there is little difference in effectiveness between them, CDEC has shown better residual effects and better grass control and is less affected by weather conditions. *Rock melons.* CDEC and amitrole appeared to be non-injurious. *Pumpkins.* Pre-emergence herbicide applications have caused definite increases in yield and quality.—Hawkesbury agric. Coll., Richmond, N.S.W.—From *Weed Abstr.*, **10**, No. 254.

4424. Matienko, B. T.
On the morphology of the fruit chromoplastids in the cultivated Cucurbitaceae Juss. [Russian, with English summary 6 lines.]
Bot. Žurnal, 1960, **45**: 1446-61, bibl. 55, illus.

The initiation and subsequent development of the fruit chromoplastids in the genera *Cucurbita*, *Melo* and *Citrullus* are described and illustrated. Striking similarity between the microscopic structure of the chromoplastids of the 3 species is noted.

4425. Efimov, M. S.
Bush forms of cucumber. [Russian.]
Agrobiologija, 1960, No. 4, pp. 622-3, illus,

The main advantage of the cucumber Hybrid No. 18 lies in its compact form, which makes mechanical cultivation possible. It is not yet recommended, however, for general cultivation.

4426. Suomela, H.
Kannattaako kasvihuonekurkun siemenen lämpökäsittely ennen kylvöä? **(Does the heat treatment of cucumber seeds pay?)**
Puutarha, 1960, **63**: 584, illus.

Dry heat treatment of cucumber seeds (for 3–4 days at 30–35° C.) accelerated germination, but the differences between treated and untreated seedlings had disappeared within a week.

4427. Ovečka, V.
Studium vlivu stáří osiva na produkční schopnost polních okurek Znojemských nakládaček (*Cucumis sativus* L.). **(A study of the age effect of the seed on the productivity of the Znojmo field pickling cucumber.)** [Russian and German summaries $\frac{1}{3}$ p. each.]
Rostlinná Výroba, 1960, **6**: 1261-74, bibl. 10.

Trials with seed stored for from 1 to 8 years showed that the production capacity of plants grown from the seed decreased significantly with increasing age of the seed after the third year, the yield decrease averaging approximately 8·80% per year. Compared with 1-year-old seed, 2-year-old gave an increased yield of 6·05% (not significant), whereas 3-year-old seed showed a decrease of 10·32%.

4428. Shifriss, O.
Sex control in cucumbers.
J. Hered., 1961, **52**: 5-12, bibl. 19.

A review of the genetical mechanism.

4429. (Gardner, R.)
Cucumber catch crop makes use of waste space.
Comm. Gr, 1961, No. 3398, p. 344.

At Lea Valley Experimental Horticulture Station the centre bed in a cucumber house was used to provide an early crop of cucumbers from earlier plants, before the outer rows of the main crop grew up under the roof. The catch crop should be removed by mid-April to avoid competition. Trials are also in progress on the Scandinavian cordon method of training cucumbers.

4430. (Peterson, L. E., and Pierce, L. C.)
New melon hybrids appear promising.
Ia Fm Sci., 1960, **15**: 613.

Burpee Hybrid and Supermarket Hybrid have shown promise for commercial planting, but Harper Hybrid could not withstand shipping as well as the others because of its thin rind.

4431. Louvet, J., and Lemaitre, C.
L'utilisation de melons greffés pour lutter contre la fusariose. **(The use of melon grafts for the control of *Fusarium*.)**
Rev. hort., Paris, 1961, **133**: 8-10, illus.

Cuttings of Cantaloup Charentais melons were grafted on about 30 different cucurbitaceous species and varieties which showed resistance to *Fusarium oxysporum* f. sp. *melonis*. *Benincasa cerifera* showed the most promise, being completely compatible with the melon scions and producing 32 healthy plants out of 35 grafts, whereas only 3 of the 25 control plants remained healthy.

4432. Masui, M., and others.
Studies on the absorption of nutrient elements in muskmelon. III. On nitrogen form and calcium levels. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 181-90, bibl. 3.

Increased levels of Ca increased plant vigour, leaf size and stem and fruit weights, and increased the N, P, Ca and Mg in the plant. Nitrate-N, by comparison with ammonium-N, increased fruit weight, reduced plant vigour, decreased the N and K contents of the plants and increased the Ca content. Supplying Ca as carbonate increased the N, P, K and Ca contents of the roots. [For part II, see *H.A.*, 31: 2405.]

4433. Casini, E.
La cultura anticipata delle zucche da zucchini. **(Forcing pumpkins.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 370-87, bibl. 15, illus.

The pumpkin variety tested (one without trailing shoots) gave equally high yields in both plastic and glass houses, but flowered 3 days earlier under glass. For growing the plants in the open, 4 types of individual covers were compared: (1) glass cloches, (2) polythene-covered square frames, (3) tripods with polythene covers, and (4) bottomless wooden boxes covered with glass. The triangular covers were the least successful, the other 3 types giving equally good results. A slightly larger average size of pumpkins was obtained under the square polythene covers, which had the advantage of easy handling for aeration, and could be propped on the north side of each plant when the latter had grown too large to cover. Marrow seeds of the zucchino type sown in polythene bags at the beginning of March germinated in 4 days, as opposed to 10 days in ordinary pots, both being placed on hot-beds under glass, and the seedlings in the bags grew faster and required only half the watering needed by seedlings in the pots. Both groups suffered equally from transplanting into polythene-covered nursery beds and at the final transplanting in the open. The initial lead of the bag-grown seedlings was not maintained, and the dwarf marrows were harvested from both groups about 20 days earlier than from direct sowing in the open. Very promising results were also obtained in the open by sowing the seeds, and raising the plants until harvest, in containers made of larger and thicker polythene bags (30 cm. upper diameter, 0·15 mm. thickness) with similar bags provided as covers in the early stages. There was no need to sow until the last week in March when using this method. [See also *H.A.*, 31: 1896.]—Fac. Agrar., Univ. Firenze.

4434. Kohashi S., J.
Mejoramiento genético de la calabaza (*Cucurbita* spp.) en México. **(Genetical improvement of the squash in Mexico.)** [English summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 16-19, bibl. 6, illus.

Variability in, and breeding and selection from, *C. pepo*, *moschata*, *maxima* and *mixta*.

4435. Leh, H.-O.
Chemomorphosen an Blüten von *Cucurbita pepo*, hervorgerufen durch Phenylborsäure. **(Floral abnormalities in squash flowers induced by phenylboric acid.)**
Naturwissenschaften, 1961, **48**: 138-9, bibl. 1.

After the appearance of the first foliage leaf plants were sprayed on 2 successive days with a 1 ml. solution of phenylboric acid. Growth was affected, and some chlorosis and modification of leaf shape was observed. The first flowers were normal, but later flowers were greatly modified, the first stages of flower formation being affected.

4436. (Peterson, L., and Peirce, L. C.)
List recommended watermelon varieties.
Ia Fm Sci., 1961, **15**(9): 16.

Charleston Gray, Blackstone and Hope Diamond are recommended for Iowa.

4437. Ivanoff, S. S.
Station releases new watermelon. Shipper is round, dark green and wilt resistant; it has consumer appeal with good flesh and rind.
Miss. Fm Res., 1960, **23**(11): 1, 6, illus.

Released by the Mississippi Experiment Station Shipper will produce 30- to 35-lb. watermelons with a ½-inch thick, smooth rind and deep red solid flesh.

4438. Ivanoff, S. S., and others.
Watermelon transplants for healthier, earlier and more profitable crops.
Bull. Miss. agric. Exp. Stat. **588**, 1960, pp. 8, illus.

See *H.A.*, 30: 5416.

4439. (Peterson, L.)
Get more watermelons with smaller spacing.
Ia Fm Sci., 1961, **15**: 631.

Spacings of 4 × 7, 8 × 7 and 12 × 7 ft. were compared, 400 lb./acre of 10–10–10 fertilizer being applied in each case. An increase of 4–5 tons/acre was obtained at 4 × 7 ft. spacing compared with 12 × 7 ft., with only a slight reduction in fruit size.

4440. Noe, F. F., and Fowden, L.
β-Pyrazol-1-ylalanine, an amino acid from water-melon seeds (*Citrullus vulgaris*).
Biochem. J., 1960, **77**: 543-6, bibl. 20.

Isolation, distribution and possible biosynthetic pathway.

4441. Staněk, M., and Wasserbauer, R.
Postřik okurek preparátem Fytostreptem, obsahujícím streptomycin a terramycin proti skvrnitosti listů vyvolané bakterií *Pseudomonas lachrymans* (Smith et Bryan) Carsner. **(Spraying cucumbers with the preparation Fytostrept, containing streptomycin and terramycin, against the leaf spot disease caused by *Pseudomonas lachrymans*.)** [Russian and German summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 1147-62, bibl. 17, illus.

Cucumbers sprayed twice with a 0·1% solution of Fytostrept, which contains 14% of a 10 : 1 mixture of streptomycin and terramycin, had 11·2% of their leaves attacked by *Pseudomonas lachrymans*, compared with 59·4% in the controls, and showed yield increases of 39–87%. Fytostrept also stimulated growth of the plants; a 0·05% solution increased the weight of green matter by 21% and a 0·1% solution by 11% over controls. [For earlier work, see *H.A.*, 29: 1430.]

4442. Staněk, M., and Přeslička, M.
Působení postřiku antibiotickým přípravkem Fytostreptem na růst okurek a na sklizeň plodů. **(The effect of sprays of the antibiotic preparation Fytostrept on the growth and yield of cucumbers.)** [Russian and German summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**:1191-204, bibl. 16.

Spraying young cucumbers with 0·05–0·15% solutions of Fytostrept (containing 16% of a 10 : 1 mixture of streptomycin and terramycin (oxytetracycline)) stimulated growth and gave increased yields. Ten days after spraying with a 0·075% solution the weight of foliage of treated plants was 52% higher than that of the controls, and the yield was 29·2% higher. With more concentrated solutions and stimulating effect was less pronounced.

4443. Toussoun, T. A., and Snyder, W. C.
The pathogenicity, distribution, and control of two races of *Fusarium* (*Hypomyces*) *solani* f. *cucurbitae*.
Phytopathology, 1961, **51**: 17-22, bibl. 16, illus.

The disease can be controlled by harvesting only sound fruit and soaking the seeds after threshing in mercuric chloride. A 4-year, cucurbit-free rotation will also reduce one of the races to a point where it is no longer a problem.—Univ. Calif., Berkeley.

4444. Martinez, J. A.
Contrôle do oídio em aboboreira e quiabeiro. **(Mildew control in muskmelons and okra.)**
Biológico, 1961, **27**: 13-15, bibl. 3.

Satisfactory control of *Erysiphe cichoracearum* on muskmelons was obtained with 0·06% Karathane emulsion and 0·35% Thiovit (wettable sulphur). On okra the infection was less well controlled by these treatments (Karathane in this case as wettable powder), but its increase was markedly lower than in the untreated controls. The recommendation is 3–6 applications at intervals of 15–10 days during the growing season.

4445. Attiah, H. H., and others.
The effect of some synthetic phosphorus compounds in comparison with sulfur dusts and sprays on the two spotted spider mite *Tetranychus telarius* complex.
[*Publ.*] *United Arab Repub. Minist. Agric., Cairo*, 1960, pp. 11.

Good control of *Tetranychus telarius* on watermelons was obtained for 6 weeks by 2 dustings of sulphur, or 2 sprays of Systox, Fosferno or Folidol, all applied at an interval of 7 days from the start of the infestation. Later applications of Systox at 7-day intervals also reduced mite populations, but yields from Systox-treated plots were poor.

4446. Bergamin, J., Maranhão, Z. C., and Gallo, D.
Tratamento de sementes de melancia com inseticidas sistemicos. **(The treatment of watermelon seeds with systemic insecticides.)** [English summary ½ p.]
Rev. Agric., Piracicaba, 1960, **35**: 207-19, bibl. 3, illus.

Seed treatment with 2% Disyston or Thimet dust gave good control of *Aphis gossypii* for 60 days after germination, the number of aphids per 8-plant plot after that period being 61 and 96, respectively, compared with 170 in the control.

4447. Bot, J.
Pumpkin fly still prefers sugar bait.
Fmg S. Afr., 1961, **36**(11): 55-6.

A bait consisting of 2 oz. 25% malathion w.p. or ¾ oz. 50% Dipterex w.p. and 3 lb. sugar in 4 gal. of water sprayed on the vines is recommended for the control of *Dacus ciliatus* and related species.—Hort. Res. Stat., Pretoria.

4448. Getzin, L. W.
Selective insecticides for vegetable leaf-miner control and parasite survival.
J. econ. Ent., 1960, **53**: 872-5, bibl. 10.

Organophosphorus insecticides were tested on cantaloupes and peppers for control of the serpentine leaf-miner (*Liriomyza munda*) and survival of the parasite (*Derostenus variipes*). Delnav and Dimethoate showed the greatest selectivity, giving lasting residual control of the leaf-miner and at the same time allowing 45 to 100% survival of the parasite larvae and pupae within the leaf. [From author's abstract.]—Tex. agric. Exp. Stat,. Weslaco.

4449. EDWARDS, C. A., AND GUNN, E.
Control of the glasshouse millepede.
Plant Path., 1961, **10**: 21-4, bibl. 2, illus.

Heavy infestations of *Oxidus gracilis* in cucumber beds were controlled with nicotine or parathion drenches [see also *H.A.*, 31: 666]. For long term control glasshouse hygiene plus the use of chlorinated hydrocarbons, especially DDT or lindane, are recommended.—Rothamsted exp. Stat., Harpenden, Herts., and N.A.A.S., Somerset.

Legumes—beans.

(*See also* 3628, 3636, 3655, 3656, 3658, 3662, 3663, 3668, 3672, 3675, 3678, 3690, 3693, 3695, 3696, 3701, 3705, 3714, 3718, 3721, 3728, 3747, 3755, 3756, 3765, 3768, 3769, 3813, 3857, 4351, 4378, 4505, 4671, 4703, 5049.)

4450. HORTICULTURE DIVISION, DEPARTMENT OF AGRICULTURE, N.Z.
Beans.
N.Z. J. Agric., 1960, **101**: 581-91, illus.

Varieties, soil and fertilizer requirements, pest and disease control.

4451. ABRAHÃO, I. O.
Melhoramento do feijoeiro. (**Phaseolus bean selection.**) [English summary ½ p.]
Bragantia, 1960, **19**: 129-61, bibl. 18.

In 8 trials with *Phaseolus vulgaris* in 1957 and 1958 the highest yields were given by varieties of the Prêto (black seed coats) and the Rosinha (pale pink seed coats) groups.

4452. ALPAT'EV, A. V., AND MUHANOVA, JU. I.
Hybrids of French beans obtained by the artificial pollination of non-emasculated flowers. [Russian, with English, German and French summaries 3 lines each.]
Vestn. sel'sk. Nauki, 1960, **5**(5): 60-6, illus.

Including data on pollination, seed formation and the progeny of 4 generations.

4453. HENRIKSEN, A.
Sortsforsøg med høje bønner. 1955-58. (**Variety trials with climbing beans, 1955-1958.**)
Tidsskr. Planteavl, 1960, **64**: 688-98, illus.

Observations on green- and yellow-podded French and runner beans.

4454. (GOTLL, R.)
College Pride, a new variety of French bean.
Agric. Gaz. N.S.W., 1960, **71**: 499.

A heavy-cropping selection from the cross Hawkesbury Wonder × Granda, which matures 3 to 5 days after Hawkesbury Wonder.

4455. ANDERSEN, A. L., DOWN, E. E., AND WHITFORD, G.
The Sanilac pea bean, its history, development and characteristics.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 214-36, bibl. 10, illus.

Sanilac, a new bush haricot-type bean variety, is resistant to all 3 races of *Colletotrichum lindemuthianum* and common bean mosaic virus 1, and highly tolerant to *Sclerotinia sclerotiorum*. It is the result of back-crossing the climbing variety Michelite with a bush-type mutant, obtained by treating Michelite seed with X-rays, and it outyields Michelite. The breeding programme, yields, canning and agronomic tests, variety characteristics, disease resistance and cultural methods are discussed.

4456. RIZOTTO, N.
La produzione di semente selezionata del fagiolo di Lamon. (**The production of selected seed of Lamon beans.**)
Agric. Venezie, 1961, **15**: 134-44, bibl. 2, illus.

Pure lines of 4 runner-bean races (Spagnolo, Spagnolit, Calonega and Canalino) have been isolated in this bean variety, the first 3 being in greater demand than the last. The main features of each are described, and brief notes are included on the control of *Aphis fabae* with Malatox P20, and of anthracnose (*Colletotrichum lindemuthianum*) and rust (*Uromyces phaseoli*) with copperized sulphur. [See also *H.A.*, 30: 3798.]

4457. PERRY, J. S., AND HALL, C. W.
Germination of pea beans as affected by moisture and temperature at impact loading.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 33-9, bibl. 6.

Beans of different moisture content were dropped from a height of 22½ ft. at 40° F. and those with damaged seed coats removed. At 12% moisture content 7% were damaged but at 18% moisture content only 0·2%. A temperature effect was established in germination tests of the beans without visible damage. The decrease in germination for beans dropped at 55° F. was 2% for beans containing 14, 16 and 18% moisture and 18% for beans containing 12% moisture. At 40° F. the decrease in germination was 6–8% and 24% for these 2 categories, respectively.

4458. CARR, D. J., AND SKENE, K. G. M.
Diauxic growth curves of seeds, with special reference to French beans (*Phaseolus vulgaris* L.).
Aust. J. biol. Sci., 1961, **14**: 1-12, bibl. 28.

Pod growth commenced immediately after anthesis and was completed in 16–17 days. Seed growth began about 9 days after anthesis and, irrespective of whether fresh weight, dry weight or length was measured, was found to be diauxic, 2 phases of high growth rate being separated by a lag phase. During the high growth rate phases growth was initially exponential but eventually declined. The lag phase lasted from about the 20th to the 23rd day. Metabolic changes and the growth of the seed associated with maturation are discussed. [From authors' summary.]—Univ. Melbourne.

4459. Skene, K. G. M., and Carr, D. J.
A quantitative study of the gibberellin content of seeds of *Phaseolus vulgaris* at different stages in their development.
Aust. J. biol. Sci., 1961, **14**: 13-25, bibl. 18.

Activity was found in two zones: zone 1 at R_F 0·3–0·4 and zone 2 at R_F 0·7–0·9. The amount of activity in each zone changed in step with changes in the growth rate of the seeds. Bean seed has a diauxic pattern of growth. During the first phase of high growth rate gibberellin activity in both zone 1 and zone 2 rose to a maximum. With the onset of the second (lag) phase of low growth rate, activity in both zones fell to a low level, and at the end of the lag phase zone 2 activity became negligible. With the onset of the third phase of high growth rate zone 1 activity rose again and reached a second maximum, coincident with the maximum growth rate of the seed. Both growth and zone 1 activity then declined. These data are interpreted in the light of existing knowledge of gibberellin activity in seeds. [From authors' summary.]—Univ. Melbourne.

4460. Runkova, L. V.
The influence of external conditions on the nitrogen content of bean cuttings treated with heteroauxin. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 66-71, bibl. 13.

Heteroauxin treatment increased the N content of the lower portion of the cutting stem. N contents increased to 160·8% of the value found in water-treated control cuttings, when both were provided with a low level of illumination (5,000 lux), and to 182·3% of the value in controls, when both were illuminated with 20,000 lux. Heteroauxin treatment at different temperatures showed that increases in N content were greater at 18–20° C. than at 12–14° C.

4461. Bach, M. K., and Fellig, J.
Metabolism of carboxyl-^{14}C-labelled 2,4-dichlorophenoxyacetic acid by bean stems: heterogeneity of the ethanol-soluble, ether-insoluble products.
Nature, 1961, **189**: 763, bibl. 9.

Chromatographic studies are reported on material extracted from bean stems, which had earlier been vacuum-infiltrated with sucrose plus labelled 2,4-D. The results suggest that the main metabolic product is a complex mixture of amino-acid amides of several different unknown acid metabolites.—Union Carbide Chem. Co., S. Charleston, W. Va.

4462. Bach, M. K., and Fellig, J.
Correlation between inactivation of 2,4-dichlorophenoxyacetic acid and cessation of callus growth in bean stem sections.
Plant Physiol., 1961, **36**: 89-91, bibl. 4.

Growth ceased as free 2,4-D disappeared, but nearly all the radioactivity of labelled 2,4-D remained in the tissues in an ethanol-soluble form chromatographically distinct from 2,4-D.—Union Carbide Chem. Co., S. Charleston, W. Va.

4463. Smith, F. L., and Pryor, R. H.
Five-year test of planting dates with five varieties of beans.
Calif. Agric., 1961, **15**(2): 12.

In trials over 5 years seed yields of Red Kidney, Pinto, Sutter Pink and California Red increased as planting was postponed from late April up to mid-June and early July, but thereafter decreased in all varieties. The variety Small White proved unsuitable for growing in the Sacramento Valley. —Univ. Calif., Davis.

4464. (Stout, B. A., Buchele, W. F., and Snyder, F. W.)
Planting for maximum seedling emergence.
Agric. Res., Wash., 1960, **9**(4): 10, illus.

Maximum emergence of bean seedlings was obtained by firming the soil at seed level and covering the seeds with a 1-in. layer of loose soil, in contrast to the usual practice of placing the seeds in loose soil and pressing the surface.—Mich. agric. Exp. Stat.

4465. Montalvo S., R.
Densidad de siembra en el cultivo del frijol 1959. (**Density of sowing French bean crops in 1959.**)
Inf. mens. La Molina, 1960, **34**(391): 7-16.

For machine sowing the best seed rates per ha. were 40–60 kg. for vigorous climbing varieties, 80–100 kg. for moderately vigorous semi-climbers and 140–160 kg. for dwarf varieties. High seed density caused competition between plants, reduced the number of pods per plant and the number of beans per pod, but it did not affect quality and was unfavourable to pests and diseases. [For 1958 results, see *H.A.*, 31: 2425.]

4466. Yamazaki, K.
Studies on the morphogenesis of crop plants under different growing conditions. Part I. Changes of the leaf structure in *Phaseolus vulgaris*.
Proc. Crop Sci. Soc. Japan, 1959, **27**: 381-4, from *Rec. Res. Fac. Agric. Univ. Tokyo, 1958-59*, 1960, No. 9, Abstr. 8.

The effects of different spacings (10 × 10 cm. and 30 × 30 cm.) and amounts of fertilizer on the leaf structure of dwarf beans were studied. Fertilization increased leaf size, and closer spacing resulted in thinner leaves with sparsely arranged mesophyll cells and larger areoles compared with widely spaced plants. The effects of close spacing were similar to those of shading and became evident when the leaves began to expand rapidly.

4467. Adams, D. F., and Sulzbach, C. W.
Nitrogen deficiency and fluoride susceptibility of bean seedlings.
Science, 1961, **133**: 1425-6, bibl. 6, illus.

Beans were grown in atmospheres with and without fluoride and in culture solutions deficient in either K, Ca, N, P or Fe. An inadvertent exposure for 15 hours to a heavier than normal F treatment caused foliar fluorosis symptoms only on the N-deficient plants fumigated for 20 days, even though higher F concentrations were found in plants in other treatments. [See also *H.A.*, 31: 2434.]—Wash. St. Univ., Pullman.

4468. Lunin, J., Gallatin, M. H., and Batchelder, A. R.
Effect of stage of growth at time of salinization on growth and chemical composition of beans: I. Total salinization accomplished in one irrigation.
Soil Sci., 1961, **91**: 194-202, bibl. 13.

Artificial sea water at 5 different dilutions was applied to the soil before sowing the beans, or 10, 20, 30 or 40 days after germination. Pre-sowing application of solutions with an electrical conductivity of 12 or 16 mmhos retarded germination and produced dark green, stunted plants. The more dilute solutions, and the later applications of all concentrations, had no visible injurious effects. The higher the saline level, and the earlier the application, the greater was the moisture content of the leaves, and particularly of the stems, at harvest. Yields of tops decreased almost linearly with increasing salinity, especially with early applications. Pod yields increased at the lower salinity levels, and even at high levels they were not significantly reduced where flowering had begun at the time of application. The Ca and Mg contents, and to a small extent the Ca/Mg ratio, increased with increasing salinity, the leaves being more responsive than the stems. Stem Na increased gradually with increasing salinity up to a moderate level, and very markedly at high levels, particularly with early application; accumulation of K was similarly affected, but in a more linear manner. Both the Na and K contents were more affected in the stems than in the leaves.—U.S.D.A., Norfolk, Va.

4469. Taper, C. D., and Leach, W.
Note on the effects of calcium concentration in culture solutions upon the leaf and whole plant absorption of iron and manganese by dwarf kidney bean.
Canad. J. Bot., 1961, **39**: 437-8, bibl. 1.

An increase in the Fe concentration reduced the uptake of Mn, an increase in the Mn concentration reduced the uptake of Fe, and an increase in the Ca concentration reduced the uptake of both Fe and Mn. At a high Ca level of 143 p.p.m. the Fe : Mn ratio for healthy growth was approximately 2, and the plants needed more Fe (0·458 to 0·740 mg./g. dry weight) than when Ca was supplied at 42 p.p.m., when the minimal Fe requirement was 0·299 to 0·476 mg./g. [For earlier work, see *H.A.*, 28: 439.]—McGill Univ., Quebec.

4470. Vargas S., R.
Abonamiento e inoculación en el cultivo del frijol, 1957. (**Fertilization and inoculation in bean growing, 1957.**)
Inf. mens. La Molina, 1958, **32**(372): 10-16, bibl. 3.

A trial was carried out on moderately fertile soil to determine the NPK needs of a bean crop and the effect of Nitragin (a culture of *Rhizobium phaseoli*). High N (100 kg./ha. as guano) gave the highest yield, viz. 2,018 kg. per ha. compared with 1,581 kg. in the control, and was economically profitable, but inhibited the development of nitrifying bacteria. Nitragin had little effect as the soil was well supplied with the specific bacteria. Mineral P plus K increased yields but did not pay. Yield was increased by mineral P alone but not by mineral K alone. The P in guano had no effect, being mostly insoluble.

4471. Kamata, E.
Morphological and physiological studies on nodule formation in leguminous crops. Parts III to VI.
Proc. Crop Sci. Soc. Japan, 1958, **26**: 255-8, 258-60, **27**: 245-8; 1959, **27**: 367-71, from *Rec. Res. Fac. Agric. Univ. Tokyo, 1958-59*, 1960, No. 9, Abstr. 6.

In Part III varieties of 17 species of leguminous crops were classified according to the site of root nodule formation and also on the basis of the site of the first infected cell in the host tissues. Part IV deals particularly with the carbohydrate levels required for bacterial growth in the host tissues. In Part V the preponderance of nodule formation at the bases of roots or rootlets is attributed to the higher concentrations of sugar in this portion. The last paper traces in more detail the mechanism of nodule formation in 2 species. Horticultural crops mentioned in these papers include kidney beans, peas and broad beans.

4472. Masefield, G. B.

The effect of irrigation on nodulation of some leguminous crops.

Emp. J. exp. Agric., 1961, **29**: 51-9, bibl. 4.

The effect of irrigation on nodulation was studied in the field over four seasons on a clay soil. The main crops used were *Vicia faba*, *Pisum sativum* and *Phaseolus vulgaris*. Irrigation water was applied at regular intervals irrespective of weather conditions, but in lesser quantities when the soil was wet. The results show that irrigation may in this environment increase the weight of plants in a dry season, or more rarely depress it in a wet one. The number of nodules was increased by irrigation in all experiments but one; the weight of nodules on the plants also showed an increase in all cases. With *Vicia faba* and *Pisum sativum*, whose nodules are attacked by larvae of the weevil *Sitonia lineata*, irrigation affected a useful degree of control of these larvae and so prolonged the life of nodules. [From author's summary.]—Oxford Univ.

4473. Cruchet, P.

Essai de couverture du sol au moyen de polyéthylène (P.V.C.). **(Trials on covering the soil with polythene (P.V.C.).)**

Rev. hort. suisse, 1961, **34**: 113-14, illus.

Plants of Crussol kidney bean and Diamant squash were grown through slits in 170-cm. wide 0·1-mm. thick black polythene firmly anchored along each edge. The beans were severely attacked by *Ascochyta*, and the yield per 100 sq. m. was 99 kg. compared with 122 kg. for the control; the polythene did, however, give earlier yields. With squash, the polythene produced a yield equivalent to 5·13 francs per sq. m. compared with 4·77 francs for the control.

4474. Roberts, H. A.

Weed control with dinoseb (amine) in runner and French beans.

J. hort. Sci., 1960, **35**: 266-74, bibl. 4.

The use of dinoseb (amine) as a residual pre-emergence herbicide for control of annual weeds was investigated in 12 field experiments. Rates of 3 and 6 lb. per acre of actual dinoseb gave excellent results on most dicotyledonous weed species and a partial kill of *Poa annua*. At 3 lb. per acre dinoseb had no adverse effect on emergence, growth, maturity or yield on runner, dwarf French and climbing French beans. In most experiments 6 lb. per acre was similarly without adverse effect, but, when spraying with this rate was followed by heavy rain, some retardation of growth and depression of yield occurred. This yield depression was never greater than 30%, and the yields were always higher than those from control plots which received inter-row cultivation only.—[From author's summary.]—Nat. Veg. Res. Stat., Wellesbourne.

4475. Rake, L., and Holm, L.

The response of snapbeans and weeds to Eptam under different environmental conditions.

Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, pp. 45-6.

EPTC incorporated into the soil at 3, 6 and 9 lb./acre 7 days, 4 days or immediately before sowing snap [French] beans gave almost complete weed control 1 month later, while pre-emergence treatments at the same rates applied just after sowing gave only 50% control. Although the two higher rates caused severe temporary crop injury, no significant differences in yield were found from any of the treatments. In a study of the influence of rainfall (irrigation) on the response of beans and weeds to EPTC uniformly excellent weed control was obtained, and there was no significant effect on yield from method of treatment or irrigation level. Cucumbers sown in the treated plots immediately after the beans did not survive, but no toxicity to cucumbers was detected 2 months later.—Univ. Wis., Madison.—From *Weed Abstr.*, **9**, No. 1928.

4476. Tedoradze, S. G.

The resistance of bean varieties to bacteriosis in Georgia. [Russian.]

Zašč. Rast. Vred. Bolez., 1959, **4**(2): 51.

Of 406 bean varieties and hybrids tested 291 were susceptible to bacterial diseases, the most destructive of which are *B[acterium] phaseoli* and *B. medicaginis* var. *phaseolicola*. Susceptibility varied with type and morphological characteristics, and frequency of infection with the colour of the flowers in so far as they affected insect visitation. Early (5–10 April) and very late (15 May) sowings resulted in much higher rates of infection than intermediate (15–25 April) sowings. Plants from 3-year-old seeds were more resistant than those from fresh seed.

4477. Walker, J.

Variation in disease reaction within bean (*Phaseolus vulgaris* L.) varieties.

J. Aust. Inst. agric. Sci., 1960, **26**: 363-6, bibl. 12.

Inoculation tests with *Colletotrichum lindemuthianum*, the cause of anthracnose, on a number of bean varieties showed that certain bean strains were not homogeneous. Varietal selection work on beans must therefore depend on the production of pure lines.—Dep. Agric., Sydney, N.S.W.

4478. N.S.W. Department of Agriculture, Biology Branch.

Bean rust.

Agric. Gaz. N.S.W., 1960, **71**: 430-1, illus.

Symptoms and control measures for *Uromyces* *ppendiculatus* on dwarf beans; the new varieties Redlands Beauty and Redlands Belle have shown good resistance.

4479. Chambers, S. C., and Hardie, M.
Sclerotinia rot of beans.
J. Agric. W. Aust., 1960, **1**: 977-83, bibl. 3, illus.

Best control was given by a deep trenching of the soil plus a later PCNB dusting of the plants.

4480. App, F., and others.
Downy mildew on lima beans.
Plant Dis. Reptr Suppl. **257**, 1959, pp. 177-86, bibls, illus.

The subject is reviewed in 4 articles as follows: The history and economic importance of the lima bean downy mildew disease, by F. App; The development of a method for forecasting downy mildew of lima bean, by R. A. Hyre; Breeding lima beans for resistance to downy mildew, by R. E. Wester and R. E. Cetas; and Control of lima bean downy mildew by fungicides, by J. W. Heuberger and D. F. Crossan.

4481. Petersen, L. J., DeVay, J. E., and Houston, B. R.
The effect of gibberellic acid on the parasitism of *Rhizoctonia solani* on beans and cotton.
From abstr. in *Phytopathology*, 1961, **51**: 67.

Disease development was greater in Red Kidney bean plants grown in soil infested with the California isolate Rh-5 of *Rhizoctonia solani* and treated with a foliar spray containing 50 p.p.m. potassium gibberellate than in plants not treated with GA. Studies on the translocation of radioactive GA showed that little, if any, GA was excreted by the roots. Thus, it is doubtful if GA acted directly as a specific stimulant on isolate Rh-5 in the pre-penetration stages.

4482. Lordello, L. G. E., and Santos, C. F. de O.
Incidência de nematóides em culturas de feijão. **(The incidence of nematodes in bean crops.)**
Biólogico, 1960, **26**: 213-17, bibl. 8, illus.

Measures available for controlling the nematodes *Meloidogyne javanica* and *M. incognita* in bean crops are: (1) soil fumigation with DD or with ethylene dibromide (a costly procedure in São Paulo); (2) flooding the soil with water for 2–3 months (preferably in the hot season); and (3) crop rotation with a minimum of 3 years from one bean crop to the next. Groundnuts and *Crotalaria spectabilis* are immune to both nematodes, and where infestation is confined to *M. javanica*, cotton and sweet potatoes could also be included in the rotation.

4483. Morris, O. N.
The development of the clover mite (*Bryobia praetiosa*, Koch, Tetranychidae) in relation to the nitrogen, phosphorus, and potassium nutrition of its host.
Diss. Abstr., 1960, **21**: 1301-2, being *L.C. Card No. Mic.* 60-4246 of 102 pp.

The effects of N, P and K contents of bean leaves on the fertility and longevity of *Bryobia praetiosa* under greenhouse conditions.

4484. Herne, D. C.
Combinations of acaricides with complementary activity.
J. econ. Ent., 1960, **53**: 967-8, bibl. 2.

Control of the two-spotted spider mite (*Tetranychus telarius*) on scarlet runner beans in the greenhouse was greatly improved when Tedion was added to Phosdrin or Guthion, and the combination of Tedion with polybutene (Indopol L-100) [see *H.A.*, 30: 1962] was especially effective.—Canada Dep. Agric., Vineland Stat., Ont.

4485. Ratcliffe, R. H., Ditman, L. P., and Young, J. R.
Field experiments on the insecticidal control of insects attacking peas, snap beans and lima beans.
J. econ. Ent., 1960, **53**, 818-20, bibl. 4.

Methyl Trithion, Dimethoate, Phosphamidon and Thiodan greatly reduced incidence of the pea aphid (*Macrosiphum pisi*) on peas [see also *H.A.*, 30: 693]. Dibrom, Phosphamidon, Dilan and ethion gave considerable control of the potato leafhopper (*Empoasca fabae*) on snap beans, but Dimethoate gave the best control. Sevin and DDT gave 95 to 100% reduction of corn earworm (*Heliothis zea*) injury on green beans, and sprays of DDT and Sevin repeated at 10-day intervals for corn earworm control gave 98·9 to 99·4% clean pods on lima beans. [From authors' abstract.]—Md agric. Exp. Stat.

4486. Genung, W. G.
The bean leaf skeletonizer, *Autoplusia egena*, and its control on bush snap beans in the Everglades.
J. econ. Ent., 1960, **53**: 566-9, bibl. 11.

Relatively serious damage to beans was caused by *A. egena* in 1957, 1958 and 1959. The numerous natural enemies of the species are listed. Of the insecticides tested the following have given the best control: toxaphene, dieldrin, Thiodan, Phosdrin, Kepone, Perthane, SD-4402 and *Bacillus thuringiensis*.—Univ. Fla Everglades Exp. Stat., Belle Glade.

4487. McEwen, F. L., and Hervey, G. E. R.
The effect of lygus bug control on the yield of lima beans.
J. econ. Ent., 1960, **53**: 513-16, bibl. 5, illus.

Field tests showed that in years when the tarnished plant bug (*Lygus lineolaris*) population was high yields of Fordhook 242 and Henderson Bush lima beans could be substantially increased in western New York through the application of insecticides [such as DDT, parathion, malathion, trithion and Sevin]. In addition, plants protected from tarnished plant bug nymphs with insecticide or by screening set more pods earlier in the season and reached maturity earlier than did unprotected plants. [Authors' abstract.]—N.Y. St. agric. Exp. Stat., Geneva.

4488. Perry, J. S., and Hall, C. W.
Storing and handling pea beans.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 444-54, bibl. 4.

Microscopic examination revealed the development of moulds in pea (navy or haricot) beans before these could be detected by the normal methods of inspection. At 55° F. and 90% R.H. mould-free storage life was 4 months, and at 75% R.H. 8 months. A screw-type conveyor caused negligible damage when operated horizontally, but it caused 1·1% and 1·5% cracked seed coats when worked at 15° and 28° from the horizontal, respectively. In dropping experiments increasing the temperature of the beans from 40 to 70° F. reduced damage by one-half. Damage, mostly cracked seed coats, was roughly proportional to the height of the drop.

4489. Last, F. T., and Nour, M. A.
Cultivation of *Vicia faba* L. in Northern Sudan.
Emp. J. exp. Agric., 1961, **29**: 60-72, bibl. 19.

Experiments are described, which investigated varieties, sowing rates, fungicidal sprays, dates of planting and nutrition. Powdery mildews (caused by *Leveillula taurica*, *Erysiphe umbelliferarum* and *E. polygoni*) were well controlled by lime-sulphur and sulphur sprays, and control was best on crops sown at the optimal planting date. Nitrogen, and to a lesser extent P + K, increased yields and were most effective on crops in which powdery mildew was controlled by spraying. Doubling the usual seed rate increased yields of the local variety by 48%, this effect being less marked with 2 introduced varieties which gave somewhat lower yields.—Univ. Khartoum.

4490. Klingmüller, W.
Die Schädigung von *Vicia faba*-Samen durch Trocknung—Ein umkehrbarer Effekt. **(Damage to broad bean seed by drying—a reversible effect.)**
Planta, 1961, **56**: 290-301, bibl. 34, illus.

If dried to a water content below about 9% seeds of *Vicia faba* var. *minor* were damaged, as shown by a reduction of the germination rate and of the subsequent growth. Seeds which had been dried and then allowed to absorb moisture to give a medium water content produced normal seedlings. The results suggest that in dry beans rapid uptake of water during the first 24 hours of soaking is responsible for the damage. [See also *H.A.*, 30: 3817.]—Univ. Giessen.

4491. Inako, Y., Fujikura, T., and Hamada, K.
Fruiting habit of "Issun" broad beans. II. Flower-bud differentiation, flowering and fruiting on the branches developed at different stages. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 197-202, bibl. 10.

Flower bud differentiation was first observed in mid-November, 38 days after planting, or 15–20 days after the average daily temperature fell below 15° C. Once they had formed the flower buds developed rapidly, forming pollen mother cells at the end of December, and thereafter remaining quiescent until the end of February. Flowering occurred first on the third lateral shoot, but the largest number of flowers were produced on the sixth lateral shoot. Thinning the shoots to 6 per plant increased the number of flowers per shoot on the remaining shoots. [For part I, see ***H.A.***, 28: 2585.]

Legumes—peas.

(*See also* 3622, 3628, 3636, 3662, 3665, 3666, 3670, 3672, 3693, 3700, 3704, 3711, 3713, 3757, 3781, 3784, 4351, 4471, 4472, 4485, 5049.)

4492. Pea Growing Research Organization Ltd.
Annual Report, 1959, Yaxley, 1960, pp. 23, 1s. 6d.

Experimental work: Propham (3 lb. w.p./50 gal./acre) gave most effective control of wild oat in peas, but at least 4 days should elapse between the pre-sowing application and drilling. The results are summarized of trials on 28 varieties for susceptibility to downy mildew. Investigations on pea moth emergence and trials with new varieties are described briefly. In spacing trials basal branching increased with wider spacing, but narrow rows outyielded wide rows.

4493. De Rinaldini, V.
Il pisello per l'industria conserviera. **(Peas for the canning industry.)**
Ital. agric., 1960, **97**: 965-72, illus.

The subjects discussed are varieties (Monopol, Piccolo Provenzale), soils, preparation of soil, manuring and fertilization (K important), spacing (20–40 by 3–8 cm.), seed rate (140–200 kg. per ha), sowing depth (3–5 cm.), cultural operations and harvesting.—Staz. sper. Indust. Conserv. alim., Parma.

4494. AJZENŠTAT, JA. S.
The effect of the quantity of pollen on the character of the hybrids. [Russian, with English, German and French summaries 5 lines each.]
Vestn. sel'sk. Nauki, 1960, **5**(5): 50-9, bibl. 18.

Analysis of the F_1 and F_2 generations of several families of hybrid peas pollinated with different amounts of pollen showed that pollination with different amounts of pollen leads to predominance of the maternal type in the offspring.

4495. LOCKWOOD, J. L.
Progress and problems in breeding peas resistant to root rot.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 358-66, bibl. 9, illus.

Studies were made on the resistance to *Aphanomyces* root rot of 805 pea introductions and on the resistance to *Fusarium* root rot of 793 introductions. No accessions were highly resistant or immune to *Aphanomyces* root rot, but 69 showed some resistance to *Fusarium* root rot [see also *H.A.*, 31: 711 and 2473]. Exposing seeds of P.I. 169604 selection and Early Perfection to gamma radiation failed to produce any mutants possessing high resistance to either fungus. Preliminary attempts to cross commercial varieties with a highly resistant type of *Lathyrus* were unsuccessful.

4496. POLUNIN, JA. JA.
Heterosis (increased vitality) in the descendants of grafted plants. [Russian.]
Agrobiologija, 1960, No. 4, pp. 530-8.

It was found that pea plants grafted on another variety gave higher yields of seeds and that the resulting seedlings gave higher yields of green peas in 4 subsequent years.

4497. SCHÖLDÉEN, C., AND BURSTRÖM, H.
Physiological studies of an ageotropic pea mutant.
Physiol. Plant., 1960, **13**: 831-8, bibl. 6, illus.

Germination, growth and respiration were irregular, but the responses to external auxin application and to light were normal.—Dep. Plant Physiol., Lund.

4498. SPASOJEVIĆ, V. S.
Efekt pojedinačnog i kombinovanog dejstva giberelinske i askorbinske kiseline na aktivnost ćeličnih deoba u graška. **(The separate and combined effects of gibberellic and ascorbic acids on cell division in peas.)** [English summary 1 p.]
Arh. poljopr. Nauke, 1960, **13**(40): 14-22, bibl. 23.

Seeds were soaked for 10 hours in GA at 100 and 200 p.p.m., in ascorbic acid at 0·25% and in combinations of the two before being germinated in water. GA stimulated mitosis in the root tips and was not antagonistic to ascorbic acid, the effects being additive. The large number of binucleate cells indicated that GA stimulates nuclear rather than cell division. GA also increased the rate and uniformity of germination. The stem elongation produced was due to a longitudinal increase in cell dimensions. In the presence of ascorbic acid no etiolation accompanied the elongation.—Inst. Veg. Crops, S. Palanka.

4499. GOTTSCHALK, W.
Über die zeitliche Aufeinanderfolge bestimmter Gestaltungsprozesse bei der Ausdifferenzierung von Vegetationskegeln zu Blüten. **(On the succession in time of distinct morphogenetic processes in the transformation of vegetative apices to flowers.)**
Naturwissenschaften, 1961, **48**: 59, illus.

After treating pea seeds with 11,000 r a mutant with greatly modified flowers segregated in the X_2 generation. The gynoecium was functional, the androecium showed structures intermediate between carpels and stamens, the corolla was reduced, and the calyx was abnormal with carpel-like structures among the sepals. This resulted from the action of a recessive gene, which disturbed the orderly succession of the two distinct processes that take place during the development of a flowering apex. —Inst. Landw. Bot., Univ. Bonn.

4500. SCHUPHAN, W., AND POSTEL, W.
Biologische Wertigkeit des Erbseneiweisses im Spiegel der essentiellen Aminosäuren. **(The level of essential amino-acids and the biological value of pea protein.)**
Reprint from *Z. LebensmittUntersuch.*, 1960, **113**: 223-9, bibl. 30.

Protein from unripe, green and ripe, dried peas was compared. Ripe peas were richer in leucine, icoleucine, lysine, phenylalanine, valine and histidine, and unripe peas were richer in arginine. Protein from the larger varieties contained more leucine, isoleucine, lysine, arginine and phenylalanine than protein from the smaller varieties, which, however, contained a higher proportion of threonine. With an additional period of ripening the proportions of leucine, isoleucine, lysine, phenylalanine, histidine and valine rose, while that of threonine fell. Tryptophan and methionine did not change, while arginine increased to a certain level and thereafter decreased. The value of the protein was increased by this additional ripening. The quality of pea protein was limited by its low methionine content.—Bundesanst. Qualitätsforsch. pfl. Erzeugnisse, Geisenheim.

4501. SCHILLING, G.
Der Einfluss von Alterungsprozessen auf die Verteilung von Calcium und Strontium im Erbsenblatt. **(The influence of ageing processes on the distribution of calcium and strontium in the leaf of the pea.)**
Biol. Zbl., 1961, **80**: 33-6, bibl. 6, illus.

Detached leaves were dried at 70° C., or left 12 days in distilled water until they had yellowed, and then dried at 70° C. Tracer techniques showed that at the end of the ageing process (in distilled water) strontium sulphate crystals appeared in the cells, although no soluble Ca salts were detected.—Friedrich-Schiller-Univ., Jena.

4502. Hall, B. J.
Varietal responses with herbicides.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 26, pp. 4.

Examples are given of varietal differences in response to herbicides in peas, gladiolus, onions, beetroot and cucumbers. Factors to consider in breeding for herbicidal resistance are listed. The following general indications were observed in a trial in which MCPB at 1, 2 and 3 lb./acre was applied to 9 pea varieties: (1) the earlier the variety, the greater was the yield reduction with late spraying; (2) the less waxy the leaf, the greater was the susceptibility to increased concentrations of MCPB and the bigger the yield differential between early and late spraying; (3) late sprayings delayed maturation.—Hawkesbury agric. Coll., Richmond, N.S.W.—*Weed Abstr.*, **10**, No. 255.

4503. Hassall, K. A.
Effect of monuron and of related compounds on the growth of seedling peas.
J. exp. Bot., 1961, **12**: 47-55, bibl. 13.

The shoots of peas grown in a phosphate buffer were no more sensitive to monuron applied continuously than were the roots. They were, however, more readily damaged than the roots when high monuron concentrations were applied for short periods of time. Neither the root nor the shoot was more sensitive to monuron in the light than in darkness. The damage caused by a high monuron concentration was far greater at times, or under conditions. of high metabolic activity. The toxicities of alkyl or aryl substituted ureas and thioureas were closely related to their solubilities in water. [From author's summary.]—Univ. Reading.

4504. Reynolds, J. D.
Reaction of pea varieties to commonly used herbicides.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 11, bibl. 10.

For details see *Weed Abstr.*, **10**, No. 18.

4505. Hall, B. J.
Weed control in peas and beans.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 23, pp. 4.

Peas: Dinoseb gave the best results with post-emergence application and is recommended at 1 lb./acre where broad-leaved weeds are the main problem. Of pre-emergence treatments tested, EPTC at 5 lb./acre and CDEC at 6 lb./acre were the best, and consistently gave 95% grass and 65–70% broad-leaved weed control. *Beans:* Dinoseb was most effective when applied immediately before emergence, but caused severe injury if applied when the beans had started to emerge. CDEC at 6 lb./acre pre-emergence gave excellent results, and EPTC post-emergence was reasonably satisfactory.—Hawkesbury agric Coll., Richmond, N.S.W.—From *Weed Abstr.*, **10**, No. 247.

4506. Armsby, W. A., and Reynolds, J. D.
Experiments on the control of wild oats in peas: progress report 1959-60.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 9, bibl. 7.

To minimize the risk of poor pea germination where propham is used, sowing should be delayed for 6–14 days after application. In post-emergence trials only barban gave promising results against wild oats.—Pea Growing Res. Org., Yaxley.—From *Weed Abstr.*, **10**, No. 19.

4507. Clauss, E.
Die phenolischen Inhaltsstoffe der Samenschalen von *Pisum sativum* L. und ihre Bedeutung für die Resistenz gegen die Erreger der Fusskrankheit. **(The phenolic components of the seed coat of the pea and its significance for resistance to the causal organism of foot rot disease.)**
Naturwissenschaften, 1961, **48**: 106, bibl. 4.

Phenolic substances from the seed coat of peas were tested for fungistatic action. High resistance in varieties with multi-coloured flowers was found to be associated with high leucoanthocyanin contents. Leucodelphinidin, diluted to 1 : 1,000, was added to a culture of *Mycosphaerella pinodes*. Pycnidium formation was only 5·5% of that in the control and the growth of mycelium was inhibited. *Ascochyta pisi* and *A. pinodella* were also inhibited by leucoanthocyanins.—Inst. PflZücht., Quedlinburg, Berlin.

4508. Kennedy, J.
Fumigation of agricultural products. XVII. Control of *Ascochyta* blight of peas by fumigation.
J. Sci. Food Agric., 1961, **12**: 96-103, bibl. 9.

Laboratory and field trials have shown that chloropicrin will control the blight. In the variety Zelka almost complete control was achieved when seed with a moisture content of 16% was exposed at 20° C. to 97% pure chloropicrin for 72 hours. Seeds of Feltham Advance and Onward were both sensitive to chloropicrin, but seeds of a "Blue" variety were not damaged.—Imperial Coll. Field Stat., Sunninghill, Berks.

4509. Danilejko, A. V.
On the problem of selecting pea varieties for resistance to injury by pea weevil. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(6): 39-40.

See *H.A.*, 31: 718.

4510. Butovskij, A. P., and Grinevič, M. I.
Control of pea weevil. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(3): 34, illus.

Dusting with DDT or BHC at the beginning of owering was more effective than dusting during mass flowering or seed formation, and application y aeroplane was better than application by tractor r by hand.

4511. Franssen, C. J. H., and Kerssen, M. C.
The control of the peamoth (*Enarmonia nigricana* Fab.) in the Netherlands.
Reprinted from *Agric. Aviation*, 1960, **2**: 48-52, as *Meded. Inst. PlZiekt. Onderz.* **232**, 1960, pp. 4, bibl. 5, illus.

Comparative trials with aerial spraying and spraying by ground equipment have shown that the control obtained was similar provided that spraying rates and dosages (of parathion) were the same.

Lettuce and other salad crops.

(*See also* 3662, 3664, 3691, 3778, 4346, 4581, 4665, 5569, 5574, 5587.)

4512. Corns, J. B.
Breeding and development of a lettuce variety for South Texas. [Spanish summary 1 p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., *1960*. 1960, **4** (8th annu. Mtg): 58-60, bibl. 3.

Walverde, which is resistant to the prevailing strains of downy mildew (*Bremia lactucae*).

4513. Dumonthay, J.
Une intéressante laitue pommée d'été "la Satellite". **(An interesting summer lettuce, Satellite.)**
Rev. hort. suisse, 1961, **34**: 55-6, illus.

A new variety raised by the University of Geneva, which is mosaic-free and suitable for growing from June to August, and is characterized by a well-shaped head and slowness to bolt.

4514. Dowdles, D.
Germinating lettuce in summer.
Qd agric. J., 1960, **86**: 774.

Seed for summer crops should be kept in air-tight jars at 50–60° F. After long exposure to excessive heat, seeds should be soaked in water for 2 hours, strained, stored at 40° F. for 4–6 days and sown immediately. Alternatively, the seed may be soaked for 10 hours in 0·5% thiourea at 65–70° F.

4515. Verona, P. L.
Germination of lettuce seeds in darkness under stimulus of other germinating seeds.
Ric. sci., 1960, **30**: 1238-40, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-166.

The presence of seeds such as linseed, rape and wheat had a marked stimulatory effect on the germination of lettuce seeds on wet filter paper.

4516. Verona, P. L.
Action of amino-acids, vitamins and other compounds on the germination of lettuce seeds.
Ric. sci., 1960, **30**: 1391-6, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-213.

Dormancy in lettuce seeds kept in darkness was broken by a number of chemicals, including DL-alanine, L-arginine, cystine, biotin, pepsin, hydrogen peroxide, boric acid and urea.

4517. Verona, P. L.
Influenza dell'acido borico e dell'urea sulla germinazione al buio dei semi di lattuga. **(The effects of boric acid and urea on the germination of lettuce seeds in darkness.)**
Sementi elette, 1960, **6**(6): 32-5, bibl. 6.

The germination of seeds of 4 strains of the variety Trocadero and 2 of Preferita in darkness ranged from 17 to 21% in water, from 48 to 100% in 0·1% boric acid and from 50 to 100% in 0·1% urea. The black-seeded strains were much more responsive than the white-seeded to both boric acid and urea.

4518. Porto, F., and Siegel, S. M.
Effects of exposures of seeds to various physical agents. III. Kinetin-reversible heat damage in lettuce seed.
Bot. Gaz., 1960, **122**: 70-1, bibl. 11.

Following the exposure of air-dry Early Curled Simpson lettuce seeds to a temperature of 75° C. for 1 hour their germination in a buffer solution was markedly reduced. However, germination of heat-injured seeds was restored by kinetin, and at the optimum concentration, 10^{-5} M, the amount of germination by heat-injured and control seeds was identical. [From author's summary. For Part II, see *H.A.*, 23: 3743.]—Union Carbide Res. Inst., White Plains, N.Y.

4519. Haber, A. H., and Luippold, H. J.
Dormancy resulting from gamma-irradiation of lettuce seed. [French and German summaries.]
Int. J. Radiat. Biol., 1959, **1**: 317-27, illus., from *Biol Abstr., Sect. D*, 1960, **35**, Abstr. 45,639.

Lettuce seeds given 300–1,000 kr gamma-rays showed inhibition of germination when subsequently moistened. That this failure to germinate was caused by seed dormancy was suggested by the fact that such irradiated seeds did germinate if treated with any of the following germination-stimulating agents: GA, kinetin, thiourea, pricking or light. Germination was accompanied by cellular expansions and cell divisions, irrespective of radiation and chemical treatments. The chemical treatments, which reversed the gamma-radiation effects on germination, gave no reversal of any of the following gamma-radiation effects: inhibition of respiratory rates, production of chromosomal aberrations and reduction in seedling height. [See also *H.A.*, 31: 728-731 and 1699.]—Oak Ridge nat. Lab., Tennessee.

4520. Bacchi, O.
Estudos sôbre a conservação de sementes. V. Alface. (**Seed storage studies. V. Lettuce.**) [English summary 11 lines.]
Bragantia, 1960, **19**: xli-xlv, bibl. 1.

A 4-year investigation showed that the period of viability of lettuce seed decreased with increasing temperature and increasing relative humidity. At the end of the experiment there was no loss of viability in seeds stored at room temperature and 0% R.H. or in seeds stored at 5° C. and various R.H. levels up to 70%.

4521. Simão, S., Serzedello, A., and Yamamura, A.
Influência do ácido giberélico na alface. (**The effect of gibberellic acid on lettuces.**)
Rev. Agric., Piracicaba, 1960, **35**: 193-7, bibl. 6.

Lettuce plants were treated 3 times at 10-day intervals with 1–10 p.p.m. sprays of GA. The treatments increased the weight and height of the stem and the number of leaves, and reduced the weight of the leaves and the diameter of the stem. The dry weight of the root system was not affected. The growth stimulation subsided within 8 days of each treatment. The higher the concentration, the more marked were chlorosis and stem elongation. The most satisfactory concentration for increasing vegetative growth in this variety (Batavia Bionda) was 2·5 p.p.m., and flowering was accelerated at 10 p.p.m. The commercial application of the treatment is not recommended. [See also *H.A.*, 31: 2482.]

4522. Fujimura, T., and others.
Studies on the fertilization of lettuce. I. Nutrient absorption at different stages of growth and the effect of nitrogen and potassium levels and their balance on growth. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 191-6, bibl. 3, illus.

Plants of the variety Great Lakes were grown in sand culture with 100, 200 or 400 p.p.m. of N and 0, 50, 100 or 200 p.p.m. of K. The highest rate of nutrient absorption occurred when growth was most rapid, and it declined in the 2 weeks preceding head formation. Growth was best with 400 p.p.m. N, regardless of the level of K. The optimum level of K differed according to the N level: at 400 p.p.m. N the highest yields were obtained with 100 p.p.m. K. The treatment producing highest yields resulted in 3·0–3·5% N and 1·7% K in the head leaves.

4523. Prest, R. L.
Queensland investigations into "stunt growth" in lettuce.
Fruit and Prod., April 1960, p. 2.

The symptoms are described of a condition resulting from the accumulation of ammonia and nitrite N in the soil and plant during the decomposition of organic materials and fertilizers. Cultural measures that should reduce or eliminate the trouble are listed.

4524. Moller, W. J., and Rogers, I. S.
Spotted wilt of lettuce.
J. Agric. S. Aust., 1960, **64**: 94-5, 106, illus.

Symptoms and prevention of a virus disease spread by thrips.

4525. Marras, F.
Intorno alla virosi nota come ingrossamento nervale (big vein) della lattuga. (**The virus disease of lettuces known as big vein.**)
Studi Sassaresi, Sez. III, 1959 (issued 1960), **7**: 69-79, bibl. 17, illus.

Tests with 10 lettuce varieties showed that the disease was soil-borne, and that susceptibility was generally moderate or high. The most resistant variety tested was Romana a pallone (balloon cos). The disease could be transmitted by soil inoculation with extracts from diseased roots, but not by leaf extracts or by mechanical inoculation of the leaves. —Ist. Pat. veg., Univ. Sassari.

4526. Miller, L. A.
Control of the six-spotted leafhopper in southern Ontario.
Publ. Canada Dep. Agric. **1076**, 1960, pp. 7, illus.

The leafhopper *Macrosteles fascifrons* transmits aster-yellows virus, especially to lettuces, carrots and celery, and can be controlled by DDT or malathion. Lettuces should be treated every 3–5 days, and carrots and celery every 7–10 days, after leafhoppers are noticed. It is also essential to destroy all weeds.

4527. Bogomolova, T. D.
Comparative embryological studies on the fertilization of chicory. [Russian, with English summary 7 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 4, pp. 197-9, bibl. 9, illus.

Fertilization of chicory was most rapid in July at 19–20° C., the pollen tube reaching the embryo sac within 30 min. of pollination. In August at 16–17° C. it took 1 hr. 30 min., and in September at 13–14° C. only 2–3 of the 16 flowers in an inflorescence became fertilized.

528. WESTGATE, P. J., AND FORBES, R. B.
Blackheart of chicory.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 389-93, bibl. 9.

Complete elimination of this physiological disorder was obtained by drenching the foliage with a $CaCl_2$ solution (2·5 lb. in 100 gal. water) weekly for 3 weeks.

4529. BIANCHEDI, A.
I radicchi di Treviso. (**Treviso "radishes".**)
Ital. agric., 1961, **98**: 37-51, illus.

The Treviso "radish" is closely related botanically to chicory. Its history and cultivation in Italy are described. The naturally dark leaves are changed to glistening, iridescent red, with large white midribs, by forcing. The variegated Castelfranco "radish" has a lettuce-like form. It is a hybrid of the Treviso "radish" and a broad-leaved endive, and forcing produces mottled leaves ranging from crimson through rust colour to mixtures of these shades with green. This type, unlike the Treviso type, must be sown in seed-beds and transplanted.

4530. PORCELLI, S.
La cicoria endiva migliorata. (**Improved endive.**)
Ital. agric., 1960, **97**: 1023-31, bibl. 17, illus.

Selection for improved biological and morphological characters (including leaf and plant shape) has given good results. Six varieties are classified according to colour, number and area of leaf, winter growth, cold resistance, plant weight, heart, and length of growing cycle.

4531. ANON.
Utilisation de baches en matière plastique dans le forçage de l'endive. (**The use of plastic sheeting for forcing endive.**)
Rev. hort., Paris, 1960, **132**: 2335-6, illus.

The use of Plastylon sheets and their advantages over conventional covers.

Mushrooms—general.

4532. SPURR, A. R.
Sources of information on mushroom research and production.
Veg. Crops Ser. Univ. Calif., Davis, **97**, 1959, pp. 14.

Owing to an oversight this most useful directory was not mentioned in *H.A.* when it appeared in 1959. Just how useful it is, however, is made particularly clear in this number of *H.A.*, which contains over 50 papers on mushrooms. Among the items listed on a world-wide basis are: Grower organizations; periodicals concerned with mushrooms, including abstracting journals; books, bulletins, reviews, bibliographies, conference proceedings and annual reports; government and university mushroom research stations and laboratories; and films on mushrooms. Information applicable particularly to the United States includes: Library sources; advisory and research services; sources of spawn; marketing and production information; and mushroom processing organizations.

4533. HELTAY, I.
Mushroom growing in Hungary in the years 1956-58. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 457-64, bibl. 6.

Of the total crop 95% was grown in caves in the rocks around Budapest. Average yields increased during the period by 30% and exports by a similar figure. Tray-cropping developed satisfactorily; the proportion of rice straw used in the compost has increased up to 15-20% of the total composting material; the 16-day aerobic composting method entirely supplanted the 28-day system.

4534. HERFKENS, J. H. J.
Some ideas about mushroom houses. [French and German summaries ¼ p. each.]
Mushroom Sci., 1959, [1960], **4**: 524-38.

Various types of wall construction in use are discussed and compared in terms of good thermal insulation, low integral heat capacity and as a vapour barrier. Extensive technical data are included.

4535. OLIVER, A. C.
Timber durability and the mushroom grower.
M.G.A. Bull., 1961, No. 133, pp. 9-12, 15-18, bibl. 10.

Deals with both naturally durable timber and the treatment of timber with preservatives (including phytotoxicity). Wood preservatives and pre-treated plywoods suitable for use by the mushroom grower are listed.—Timber Develop. Ass., Res. Labs.

4536. O'CONNOR, T.
Pasteurization room design and construction. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 539-47, bibl. 17.

Data for an electrically heated room; temperature control is obtained by means of thermistors and humidity control by a "humidstat".

4537. FAWCETT, C. H.
Mushroom farm heating.
M.G.A. Bull., 1961, No. 134, pp. 67-72.

The choice between a hot water and a low pressure steam system, and the choice of a boiler and of boiler fuel.

4538. WATSON, R.
Heating and ventilating theory and practice. [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 514-23, illus.

After discussing the relative merits of various heating systems, the author suggests a composite scheme to provide both normal- and peak-heating for a group of houses, together with a ventilation plant. [From author's summary.]—B. Perkins, Ltd., Peterborough, Northants.

Mushrooms—strains and other edible fungi.

(*See also* 4564, 4565.)

4539. HUGHES, D. T.
Chromosomes of the wild mushroom.
Nature, 1961, **190**: 285-6, bibl. 6, illus.

As n = 12, as with the cultivated forms, reasons other than a difference in chromosome number must be sought to account for the failure to hybridize wild and cultivated varieties.—Univ. Coll. Wales, Aberystwyth.

4540. BORZINI, G., AND SCURTI, J. C.
Growing of monosporous strains of *Psalliota campestris* (cultivated form). [French and German summaries ¼ p. each.]
Mushroom Sci., 1959, [1960], **4**: 132-5, bibl. 5, illus.

The differences obtained in the mycelial and fruiting body characteristics by the culture of monosporous strains tended to disappear with repeated asexual culture.—Lab. sper. Fitopat., Torino.

4541. UZONYI, A. L.
Data on the determination of the cropping value of wild mushroom strains taken into cultivation. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 379-92, bibl. 5.

Cropping behaviour of 8 wild strains is evaluated and selective breeding from such strains recommended.

4542. PASSECKER, F.
Kulturversuche mit Wildformen des Champignons und anderen Agaricaceen. (**Experiments in the cultivation of wild species of mushroom and other agarics.**) [English and French summaries ¾ p. each.]
Mushroom Sci., 1959, [1960], **4**: 477-83, illus.

Successful cultivation of *Psalliota augusta*, *P. pseudarvensis*, *Tricholoma japonicum*, *T. nudum*, *Pleurotus ostreatus*, *P. olearius*, *Lepiota procera*, *Clitocybe geotropa*, *Lactarius deliciosus* and *L. sanguifluus*.

4543. KALMÁR, Z.
Termesztési kísérletek ördögszekér tölcsérgombával. (**Trials on growing *Clitocybe eryngii*.**) [English and Russian summaries ½ p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(4): 119-25, bibl. 5, illus.

Of 6 species of edible fungi cultivated in a cellar *Clitocybe eryngii* grown on composted hay showed the most promise. The caps tended to be deformed and remained white but were equal in flavour to those growing in the open.

4544. BLOCK, S. S., TSAO, G., AND HAN, L.
Experiments in the cultivation of *Pleurotus ostreatus*. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 309-25, bibl. 14, illus.

On a small scale good yields of *Pleurotus ostreatus* were obtained on either sterile or composted sawdust, but the sporophores were different from the natural forms. With composted sawdust casing soil proved unnecessary. Flushes appeared in cycles of 2–2½ weeks, the optimum temperature range was 21–26° C., and the most favourable pH was 5–6·2. Soluble sugars were more suitable sources of carbon than starch or cellulose, and organic N produced more vigorous growth than mineral N. The addition of oatmeal to the sawdust was followed by vigorous growth; thiamine was essential, but not biotin.—Univ. Fla, Gainesville.

4545. GUIOCHON, P.
Germinations monospermes de la truffe, *Tuber melanosporum* Vitt. (**Monosporous propagation of the truffle.**) [English and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 294-7, bibl. 9.

A brief description of the technique used to obtain germinating truffle spores for the inoculation of young oak plants.

Mushrooms—spawn and spawning methods.

4546. HELTAY, I., AND BARBER, J.
Influence of storage at the temperature of 2° C. below zero on productivity of the spawn (manure spawn). [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 362-78, bibl. 3.

Compared with fresh spawn, samples stored for 68, 128 and 202 days at –2° C. lost 5, 6 and 8% of their productivity, respectively, and, instead of giving 80% of the total yield in the first 30 days, gave only 78, 76 and 73%, respectively. There was also an irregular and non-significant prolongation of the cropping period. On the other hand, cold storage had no effect on the degree of ramification or rate of development of the mycelium, or on the speed with which it came into cropping after casing.—Mycol. Lab., Budapest.

4547. LAMBERT, E. B.
Improving spawn cultures of cultivated mushrooms. [French and German summaries 8 and 7 lines.]
Mushroom Sci., 1959, [1960], **4**: 33-51, bibl. 59.

A review of genetical methods.

4548. HUHNKE, W., AND v. SENGBUSCH, R.
Active mycelium spawning of cultivated mushrooms. (Preliminary report.)
Dtsche Gartenbauwirtsch., 1959, Vol. 7, No. 12, translated extract in *M.G.A. Bull.*, 1960, No. 126, pp. 205, 207-8, 213-14.

A new method of spawning developed at the Max-Planck Institute, Hamburg-Volksdorf, is described. It is called the "active mycelium penetration method" and consists essentially of the thorough mixing of actively growing mycelium into all parts of freshly pasteurized nutritive compost in quantities many times larger than those usually employed. By comparison with Rasmussen's "shake-up spawning" method there is a considerable saving in time between spawning and casing, and by comparison with Hauser's "through spawning" method, which requires a large amount of spawn, the new method needs less spawn than usual. Possible disadvantages of the new method include the need for about 10% more compost, the time taken to plant the "active mycelium" (which could, however, be reduced by the use of a spawning machine) and, most important, the risk of spreading pests and diseases.

4549. RASMUSSEN, C. R.
"Shake-up-spawning". [French and German summaries 5 and 4 lines.]
Mushroom Sci., 1959, [1960], **4**: 21-9, bibl. 9.

In this method the compost is shaken up very thoroughly in the beds or mixed in special machines 7–14 days after spawning. In trials untreated compost in 18-cm. deep beds gave 170 kg. of mushrooms per ton of fresh manure, whereas the shaken-up compost in 27-cm. deep beds produced 278 kg., although in both cases the first flushes were ready for picking on the same day. The theory of the method is discussed.—Danish Mushroom Res. Stat., Lyngby.

4550. HAUSER, E., AND SINDEN, J. W.
Industrial research and investigation into some factors affecting yield. [French and German summaries ¼ p. each.]
Mushroom Sci., 1959, [1960], **4**: 342-8, bibl. 3.

Results of experiments are given, which show that both the quantity and the method of distribution of spawn in the compost influence the time and size of the crop. Within limits, however, the yield from any method used is fairly closely related to the amount of compost.—Champignon Lab., Gossau-Zürich.

Mushrooms—composts and casing materials.

(*See also* 4543, 4544.)

4551. PENNELL, E. L., AND BOVENKERK, J. C.
Studies on horse manure compost and mushroom yields. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 326-31.

Much variation in samples of stable manure has been observed, and, particularly in recent years, a decline in the N and urine serum content has been noted. The choice of organic supplements depends on cost. The percentage of organic matter was found to fall during cropping; pH also fell in the early stages of cropping but then gradually increased.—Grocery Store Products Co., W. Chester, Pa.

4552. RASMUSSEN, C. R.
Further experiments with pig manure. [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 332-41, bibl. 14.

Short term (7 days) composting with pig manure and deep beds gave higher yields than long composting and shallow beds. Ordinary inorganic supplements had no effect; gypsum, however, considerably increased yields. Water added to the compost at filling increased yields, but when added after peak-heating it reduced the crop. [For earlier work see *H.A.*, 30: 3852.]—Danish Mushroom Res. Stat., Lyngby.

4553. HELTAY, I., AND ZÁVODI, I.
Rice-straw compost. [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 393-9, bibl. 3.

Composts containing 10–75% of dry rice straw have been prepared, but in large scale cropping experiments 10–20% rice straw, composted for 16 days under aerobic conditions, was used. The fertilizer requirements, which differ considerably from those of pure FYM compost, have been worked out, and yields averaging 15–25% higher than those from unmixed compost have been obtained. In cellar-cropping without peak-heating, crops of 80–100 kg./ton can be produced.—Mycol. Lab., Budapest.

4554. RASMUSSEN, C. R.
Peak-heating and its effect on cropping yields. [French and German summaries ¼ p. each.]
Mushroom Sci., 1959, [1960], **4**: 349-61, bibl. 7.

The results of some peak-heating experiments and related problems are discussed. Composts requiring only a brief peak-heating period are recommended, and can be obtained by prolonging the composting time. A compost can be produced which only requires "pasteurization" and no aeration.—Danish Mushroom Res. Stat., Lyngby.

4555. Renoux-Blondeau, H.
Étude de certains actinomycetes se développant au cours de "la pasteurisation" du fumier. Leur action sur le développement ultérieur du champignon de couche. **(A study of certain actinomycetes which develop during the "pasteurization" of manure: their effect on the later development of the cultivated mushroom.)** [English and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 153-75, bibl. 4, illus.

The thermophilic actinomycetes, *Streptomyces* and *Micromonospora*, were studied. These appear as a fine white dust on the straw during the peak-heating of mushroom compost at 50–60° C. Their favourable effect on mushroom development is attributed either to the production of growth substances or useful assimilable compounds, or to the inhibition of deleterious micro-organisms by antibiotic secretion.—Centre nat. Rech. agron., Versailles.

4556. Chapman, G. W.
Pot culture of mushrooms in the small laboratory. The role of ammonia in composting and other illustrations of the method. [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 144-52, bibl. 7.

Ammonia supplied as urea was found to encourage the bacteria at the expense of the fungi, to hasten composting and to increase yields mainly in the first flushes, whereas the addition of molasses had the opposite effect. In some cases fermenting the peat casing soil with dried blood also increased the yield.

4557. Flegg, P. B.
The functions of the compost and casing layer in relation to fruiting and growth of the cultivated mushroom (*Psalliota* (*Agaricus*) *hortensis*). [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 205-10, bibl. 14.

Recent work is reviewed. Increasing the moisture in the casing layer reduced fruiting but increased the weight of the individual sporophores. Reducing the salinity of the compost, particularly at the surface, increased fruiting. [See also *H.A.*, 30: 2264 and 2265.]—Glasshouse Crops Res. Inst., Littlehampton.

4558. Riethus, H.
Versuche mit Deckerde. **(Experiments with casing soils.)** [English and French summaries 6 and 8 lines.]
Mushroom Sci., 1959, [1960], **4**: 451-6.

In tests on loam, clay, peat, homogenized soil, sand and charcoal as casing soils, no connection could be found between their analyses and crop yields. A mixture of these materials was more satisfactory than any of the materials used alone.—Techn. Univ., Berlin.

4559. Reeve, E., Backes, R. W., and Schramer, J. M.
Casing soil moisture studies. [French and German summaries ⅔ p. each.]
Mushroom Sci., 1959, [1960], **4**: 198-204, bibl. 3.

Neither electrical resistance nor vacuum gauge tensiometers were found satisfactory for measuring moisture in mushroom beds. Well supervised mercury manometers were accurate, but too delicate for commercial use. The optimum soil moisture was found to be in the range 60–90% of field capacity; yields were lowest when soil moisture was allowed to fall to 20–30% before watering and highest when it was maintained above 50% of field capacity. Low moisture levels resulted in small size and a greater number of mushrooms per sq. ft. The moisture content of the crop was related to the soil treatment.—Campbell Soup Co., W. Chicago.

4560. Reeve, E., and others.
Mushroom casing soil—cropping experiments. [French and German summaries ⅓ p. each.]
Mushroom Sci., 1959, [1960], **4**: 251-9, bibl. 14.

Yields were not affected by the addition of either soil conditioners or inorganic salts to a mineral casing soil, or by adding small amounts of KCl or ammonia to a muck soil. They were, however, drastically reduced by large additions of KCl to the muck soil. Cropping was not increased by inert physical additives, or reduced by blanking out 20% of the productive area with bricks. Increases in yield obtained in the laboratory by casing with certain muck soils instead of a standard mineral soil were not repeated in commercial trials. —Campbell Soup Co., W. Chicago.

Mushrooms—growth and environment.

4561. Bohus, G.
Investigations concerning the life processes of the cultivated mushroom.
Mushroom Sci., 1959, [1960], **4**: 86-131, bibl. 51.

The literature on this subject and some original work are considered under carbon metabolism, nitrogen metabolism, mineral metabolism and the role of growth-promoting substances. Although the pentoses, d-xylose and 1-arabinose, are the most suitable sources of carbon, the hexoses, d-glucose and d-fructose, are readily utilized, as are cellobiose, cellulose and a number of organic acids. Urea, ammonium salts, nitrates, glutaric acid, glycocoll and amino-acids, of which asparagine and α-alanine are the most effective, are used to supply nitrogen. Of the other major nutrients, P is the most important and Ca the least. The cultivated mushroom requires aneurin and biotin for normal growth and can synthesize other growth-substances, although somewhat slowly.—Museum nat. Hist., Budapest.

4562. Rasmussen, C. R.
Controlled air movement and its effect on cropping yields. [French and German summaries $\frac{1}{3}$ p. each.]
Mushroom Sci., *1959*, [1960], **4**: 222-34, bibl. 8, illus.

By adequate re-circulation of the air above the beds maximum crop yields were obtained with an air to bed ratio of only 1 cu. m. air to 10 sq. m. of bed, but above 16–20 circulations per hour yields did not alter significantly. At 16–20 circulations per hour only 1,600–2,000 l. of air per sq. m. were required, compared with 5,400 l. for 3 changes per hour with an air/bed ratio of 1·8 : 1. Normal shaped mushrooms were obtained at circulation rates well below that required for maximum cropping.—Danish Mushroom Res. Stat., Lyngby.

4563. Tschierpe, H. J.
Studies on the influence of carbon dioxide on the cultivated mushroom.
M.G.A. Bull., 1960, Nos. 122-31, pp. 43-5, 75-9, 106-15, 147-50, 197-205, 239-45, 288-95, 355-62, 403-8, 455-60, and 1961, No. 133, pp. 28-33, illus.

An English translation of the German paper abstracted in *H.A.*, 30: 3854.

4564. Block, S. S.
Developments in the production of mushroom mycelium in submerged liquid culture. [French and German summaries $\frac{1}{2}$ p. each.]
Mushroom Sci., *1959*, [1960], **4**: 287-93, bibl. 20.

Yields are high and no special production problems are encountered when mushroom mycelia are grown in submerged liquid culture on simple carbohydrate and nitrogen compounds with mineral salts. Acceptable flavours are obtained with *Agaricus campestris*, *Morchella crassipes*, *Lepiota rachodes* and *Coprinus comatus*, but these flavours are less pronounced from liquid culture than from solid media.—Univ. Fla, Gainesville.

4565. Heltay, I., and Latkoczky, U. A.
Investigations to elucidate the "degeneration" problem of the cultivated mushroom (*Psalliota bispora* (Lge.) Möll.-Schäff.) varieties. [French and German summaries $1\frac{3}{4}$ and 1 pp.]
Mushroom Sci., *1959*, [1960], **4**: 52-85, bibl. 13, illus.

To study the effect of the propagation medium on the cropping capacity of a mushroom strain, spores from a wild bispored variety were cultured in malt extract, peaty rye grain, clean rye grain, hay, peaty maize grain and clean maize grain. Repeated transfers to similar media were made and the cropping capacity compared at intervals with that of the original spores. At the first transfer, yields from the hay cultures were as good as, or better than, the control, those from the peaty maize and rye slightly below, and those from the malt extract and pure maize grain cultures significantly lower. —Mycol. Lab., Budapest.

Mushrooms—disorders, diseases and pests.

4566. Rasmussen, C. R., Amsen, M. G., and Holmgaard, G.
"Open veiled" or "hard gilled" mushrooms. [French and German summaries $\frac{1}{4}$ p. each.]
Mushroom Sci., *1959*, [1960], **4**: 416-29, bibl. 5.

No correlation could be found between the appearance of hard-gilled mushrooms and either growing conditions or the presence of other diseases, but differences between strains were observed. In certain strains spores taken from hard-gilled mushrooms were liable to produce the same trouble in the next generation.—Danish Mushroom Res. Stat., Lyngby.

4567. Gandy, D. G.
Progress with "watery stipe".
M.G.A. Bull., 1960, No. 127, pp. 247-51, illus.
"Watery stipe"—a preliminary investigation. [French and German summaries $\frac{1}{4}$ p. each.]
Mushroom Sci., *1959*, [1960], **4**: 411-15, bibl. 3.

Covering similar ground to the paper noted in *H.A.*, 31: 2500.

4568. Storey, I. F., and Lester, E.
Watery stipe disorder of mushrooms. [French and German summaries $\frac{1}{3}$ p. each.]
Mushroom Sci., *1959*, [1960], **4**: 430-41, bibl. 12, illus.

No causal organism could be found, but poor ventilation and high humidity in the rooms were associated with a severe attack, and improvement of these conditions eliminated or reduced it. Overwatering and restricting evaporation from the casing material were also favourable for the development of the disorder.—N.A.A.S., Shardlow.

4569. Kneebone, L. R.
Investigations of the mummy disease. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 442-6, bibl. 6.

No causal organism was detected, but transmission of the disease, readily effected by intact masses of infected soil or compost, was prevented by crumbling the masses, fragmentation of the mycelium or fumigation with propylene oxide. Cross-infection was obtained between several white strains of spawn, but not between the whites and golden white or light brown strains.—Pa St. Univ.

4570. van der Vliet, M.
Some observations about diseases on mushroom farms in Holland. [French and German summaries ½ p. each.]
Mushroom Sci., 1959, [1960], **4**: 484-7.

Mycogone perniciosa, *Dactylium dendroides*, *Myceliophthora* spp., *Botrytis crystallina* and *Trichoderma* spp.

4571. Passecker, F.
Unkrautpilze auf Champignonbeeten. (**Weed fungi in mushroom beds.**) [English and French summaries ¾ p. each.]
Mushroom Sci., 1959, [1960], **4**: 488-99, bibl. 5, illus.

Clitopilus passeckeri, *Clitocybe dealbata*, *Coprinus* spp., *Peziza vesiulosa* and *Pseudobalsamia microspora.*

4572. Thomas, C. A.
Animal pests of cultivated mushrooms in the United States. [French and German summaries 1¼ pp. each.]
Mushroom Sci., 1959, [1960], **4**: 400-10.

Measures used to control nematodes, springtails, mites and flies include: removal of old compost from the vicinity of the houses; rapid composting; pasteurization at 140° F.; insecticidal spraying of walls and fittings; steam or chemical sterilization of casing soil; cleaning and sterilization of the house at the end of cropping but before removing the compost; and, between crops, wetting the bed boards to activate pests and then steaming with formaldehyde.—Pa St. Univ.

4573. Hussey, N. W.
Biology of mushroom phorids. [French and German summaries 4 lines each.]
Mushroom Sci., 1959, [1960], **4**: 260-70, bibl. 19.

The incidence of *Megaselia nigra* in Britain is declining with the reduction of outdoor growing, but the larvae of *M. halterata* remain a hazard of house growing. Partial natural control by a parasitic nematode, *Bradynema* sp., is noted.

4574. Wyatt, I. J.
Some aspects of cecid biology of importance in mushroom culture. [French and German summaries 4 lines each.]
Mushroom Sci., 1959, [1960], **4**: 271-9, bibl. 2.

Mycophila speyeri and *Heteropeza pygmaea* do not cause appreciable crop loss but render the infested mushrooms unmarketable. *M. barnesi* and *Henria psalliotae* are seldom abundant enough to become serious pests. The effects of environmental conditions on reproduction rates are noted.

4575. Hussey, N. W., and Wyatt, I. J.
Cecid control by incorporation of insecticides in composts. [French and German summaries 4 lines each.]
Mushroom Sci., 1959, [1960], **4**: 280-6, bibl. 6.

Satisfactory control was given by 50 p.p.m. BHC mixed in the compost before peak-heating [see also *H.A.*, 31: 2502].

4576. Weigel, C. A., and Gilpin, G.
Yield and quality of mushrooms from beds treated with lindane.
J. econ. Ent., 1960, **53**: 558-60, bibl. 4.

Studies were made of the tolerance of mushrooms to lindane applied in a water suspension to the bearing beds for the control of mushroom flies, chiefly the sciarid fly, *Bradysia fenestralia* (Zett.), and the phorid fly, *Megaselia agarici* Lintner. Dosages of 0·5 lb. per acre or less did not affect the yield, but 1 lb. or more tended to depress yield. Neither dosage left appreciable residues on mushrooms harvested 5 days after application. Only slight occasional off-flavours were found in canned mushroom pieces and cream of mushroom soups made from mushrooms from beds treated with 0·25, 0·5, and 1 lb. of lindane per acre 7 days or more before harvest. Samples from mushrooms harvested 3 days after treatment had musty off-flavours, which made both the pieces and the soup inferior in eating quality. [Authors' abstract.] —Agric. Res. Serv., U.S.D.A.

Mushrooms—harvesting and composition.

4577. Cooke, D., and Flegg, P. B.
Harvesting practices.
M.G.A. Bull., 1961, No. 134, pp. 55-61, bibl. 3.

Work at the Glasshouse Crops Research Institute, Littlehampton, on trashing and the stage at which to pick has shown that by not trashing production costs were reduced without reducing the yield, and pests and diseases were not especially troublesome. The later the stage at which mushrooms were picked the greater was the weight of crop obtained, and the less was the labour required for picking. The choice of stage at which to pick for maximum return depended upon the relative prices of the various grades; in the present case cups were the most, and buttons the least, profitable.

4578. Hughes, D. H.
Mushroom discoloration research at the University of Delaware. [French and German summaries 2 lines each.]
Mushroom Sci., 1959, [1960], **4**: 447-9.

Recommended washing, handling and packaging practices.

4579. Hughes, D. H., and Rhodes, Y. E., Jr.
Changes in the amino-acid composition of *Agaricus campestris* with respect to successive crops. [French and German summaries 10 and 5 lines.]
Mushroom Sci., 1959, [1960], **4**: 176-82, bibl. 9.

Of the 25 amino-acids identified, the concentrations of 21 in successive crops were determined. In the free (alcohol soluble) amino-acid fraction the amounts of proline and histidine increased, and those of ornithine, tyrosine and phenylalanine decreased. In the protein (alcohol insoluble) fraction only arginine showed an increase and tyrosine a decrease.—Univ. Del., Newark.

4580. Mallet, L.
Les propriétés biotiques et alimentaires du champignon de Paris. **(The biochemical and nutritive properties of the Paris mushroom.)** [English and German summaries $\frac{1}{4}$ p. each.]
Mushroom Sci., 1959, [1960], **4**: 465-9.

The various organic and inorganic constituents of *Psalliota campestris* are itemized and the presence of certain trace elements is noted. It is considered that the free amino-acids and proteolytic enzymes it contains are valuable aids to digestion.

4581. Piedelièvre, R., Mallet, L., and Héros-Dekeirel, M.
Présence dans les extraits du champignon de Paris (*Psalliota campestris*) d'un facteur abiotique végétal et d'une enzyme productrice d'acides aminés. **(The presence of a vegetable abiotic factor and a proteolytic enzyme in extracts of Paris mushrooms.)** [English and German summaries $\frac{1}{2}$ p. each.]
Mushroom Sci., 1959, [1960], **4**: 298-303.

Crude extracts of cultivated mushrooms were found to retard or inhibit the growth of germinating seeds of watercress, radish, onion and lawn grasses. This is considered to be due to the presence of an abiotic substance in the extracts. A proteolytic enzyme similar in character to trypsin was isolated from the extracts.

4582. Piedelièvre, R., Mallet, L., and Renoux-Blondeau, H.
Effets abiotiques observés sur le développement des graines sous l'influence des produits extraits de *Psalliota campestris* et par son milieu de culture. **(Observed abiotic effects on seed development of products in the extract of *Psalliota campestris* and of its culture medium.)** [English and German summaries $\frac{1}{4}$ p. each.]
Mushroom Sci., 1959, [1960], **4**: 304-8.

Substances inhibiting the growth of germinating seeds were isolated in crystalline form from mushroom extracts and their effectiveness was measured [for earlier work, see *H.A.*, 28: 2602]. The similar inhibiting action produced by extracts of the culture media, which were formed by thermophylic actinomycetes, and by actinomycin C from *Streptomyces chrysomallus* was also investigated.

Onions and related crops.

(*See also* 3698, 3761, 4502, 4581.)

4583. Kazakova, A. A.
Sterility in onions. [Russian, with English, French and German summaries 5 lines each.]
Vestn. sel'sk. Nauki, 1960, **5**(10): 45-8, bibl. 11.

Seeds with cytoplasmic sterility have been obtained from Arzamas onions, and male sterility was also found in certain other onions and leeks. Sterile onions introduced into the U.S.S.R. from abroad lost their sterility.

4584. Juneja, S. L., and Gopal, R.
A case of a sectorial chimera in onion.
Curr. Sci., 1960, **29**: 483, illus.

The leaves, flowering shoot and unopened umbel all showed 2 longitudinal sectors, one green and the other albino.

4585. Tanaka, J.
Awahia: a pungent new onion for Hawaii.
Hawaii Fm Sci., 1960, 9(2): 1-2, illus.

Awahia is a new strain of Red Creole producing oblate or slightly flat bulbs $2\frac{1}{2}$–3 in. in diameter, which nevertheless still possess high soluble solids, firm texture and tight scales and show no root development after 6 months' storage. Losses from bacterial soft rot and black mould have been less than 2%, and the onion retains its flavour well on cooking.

4586. Anon.
Precocidad de desarrollo del híbrido "Granex". **(Earliness of the Granex [onion] hybrid.)**
Not. agric. Serv. Shell Agric., Venezuela, 1960, **2**: 77-8, illus.

In 2 years' trials harvesting of Yellow Granex onions was 20–30 days earlier than that of Yellow Island and Red Burgundy.

4587. ORPHANIDES, J.
Results of onion trials.
Countryman, Nicosia, Nov.-Dec. 1960, pp. 9-10.

In trials of 16 varieties 2 strains of Texas Grano gave higher yields than the locally grown variety Yeroskipou, but neither kept well; Yeroskipou had a strong flavour and kept well. Australian Brown and Copper King were also strongly flavoured, good keepers and fairly good yielders, but attracted thrips in the hot summer months and required regular dusting or spraying with insecticides. Riverside Sweet Spanish gave high yields but did not keep well.

4588. BACCHI, O.
Estudos sôbre a conservação de sementes. VI. Cebola. **(Seed storage studies. VI. Onion.)** [English summary 11 lines.]
Bragantia, 1960, **19**: lxix-lxxii, bibl. 1.

After 4 years' storage there was no loss of viability in Rio Grande onion seeds kept (1) at room temperature or 30° C. and 10% or less R.H., (2) at 10° C. and less than 20% R.H., or (3) at 5° C. and up to 70% R.H.

4589. BORKA, M.
A Zittaui vöröshagyma dugványnevelése. **(Set production in the onion variety Zittauer.)** [English and Russian summaries ½ p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 3-10, bibl. 12.

Onion seeds for set production were sown on 14 December, 11 and 15 March and 1 and 15 April. The late autumn sowing produced 9–18% higher yields than the early spring sowings and 38–58% higher yields than the delayed spring sowings. The average weight of sets from the autumn sowing was 54 g., from the first 2 spring sowings 44 g., and from the 2 later spring sowings 37 and 34 g., respectively. In general, to avoid the risk of premature germination by sowing too early in the autumn the operation should be delayed and the seed rate increased from 4 to 5–6 kg. per cadastral hold (= 0·57 ha.).

4590. PEČENICINA, A. M.
The effect of long polar days on the sugar and nitrogen contents of onions. [Russian.]
Fiziol. Rast., 1960, **7**: 602-5, bibl. 9.

Onions were grown under glass in Apatity, Kola Peninsula (67° N.L.) at day temperatures of 11–24° C. and 8–21° C. and were given either natural day length throughout or a short-day (11–13 hours) period of 3 weeks in June. The short-day treatment initially retarded bulb formation, reduced the percentage of sugars and increased that of N. Subsequently, however, the rate of bulb formation and sugar synthesis greatly improved, so that ultimately the plants that had received the temporary short-day and lower temperature treatments produced the largest and heaviest bulbs, containing the most sugars.

4591. CARSON, J. F., AND WONG, F. F.
The volatile flavor components of onions.
J. agric. Food Chem., 1961, **9**: 140-3, bibl. 14.

The more important components isolated and identified included methyl disulphide, methyl trisulphide, methyl-*n*-propyl disulphide, methyl-*n*-propyl trisulphide, *n*-propyl disulphide and *n*-propyl trisulphide. Neither monosulphides nor allylic disulphides were detected.

4592. MONTILLA, J. A., AND CHICCO R., J.
Cultivo de la cebolla. Efectos de las escardas sobre sus rendimientos. **(Onion growing. The effects of hoeings on yields.)**
Ingen. agron., 1960, No. 4, pp. 31-3, bibl. 11, illus.

In a trial in 1959 on a sandy loam, in which the hoeing treatments were carried out 3–4 days after irrigation, the yields per 24 sq. m. were: 40·1 kg. in the unhoed control, 35·25 with 1 hoeing 4 days after transplanting; 37·975 kg. with 2 hoeings 4 and 26 days after transplanting; and 33·475 kg. with 3 hoeings 4, 26 and 48 days after transplanting. These yields did not differ significantly.

4593. HALL, B. J.
Weed control in onions.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 19, pp. 8.

Under New South Wales conditions CDAA was much the best pre-emergence herbicide, except with later sowings in cooler conditions, where chlorpropham was the most effective. For post-emergence control chlorpropham gave the best results and monuron and EPTC were promising.—Hawkesbury agric. Coll., Richmond, N.S.W.—From *Weed Abstr.*, **10**, No. 252.

4594. KEFFORD, R. O.
Selective chemical weed control in onions—Victorian trials.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 24, pp. 5, bibl. 2.

Chlorpropham has been recommended to growers for pre-emergence use in onions, the seed of which should be sown exactly 1 in. deep. Deeper sowing caused injury, possibly because the seedlings were approaching the sensitive "flag" stage when they came into contact with the herbicide. Rates recommended vary from 2 lb. to 6 lb./acre. Post-emergence rates are usually 1 lb./acre higher, and are safe from the 2-leaf stage onward. On sandy market-garden soils chlorpropham is unsuitable for seed-beds, as damage has been caused even by 1 lb./acre, but 2 lb./acre applied post-emergence to transplanted seedlings caused no injury. The use of other materials is also mentioned.—Hort. Div., Dep. Agric., Melbourne.—From *Weed Abstr.*, **10**, No. 253.

4595. KAGEYAMA, M., AND OTHERS.
Studies on the application of phosphorus fertilizer to vegetables. The effect of phosphorus applied at various stages of their growth. [Japanese, with English summary ½ p.]
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1958, No. 7, pp. 87-105, bibl. 62.

Absorption of N, P and K by onions was in the proportion of 3 : 1 : 4. Greatest increases in yield were obtained with early P applications at the time of rapid shoot growth. Later P applications promoted luxurious leaf growth.

4596. LINGLE, J. C., AND WIGHT, J. R.
Test crop on acid soil indicates manganese toxicity may be aggravated by nitrogen.
Calif. Agric., 1961, **15**(3): 12-13, illus.

Rates of N fertilizer above 100 lb. N per acre had an adverse effect on the growth of onions, and leaf contents of Mn in these plants were much higher than in plants receiving less N. The effect of ammonium sulphate in this respect was greater than that of ammonium nitrate or calcium nitrate.

4597. HUSAIN, S. M.
Some aspects of the life history, epiphytology, and control of *Alternaria porri* (Ellis) Ciferri, the cause of purple blotch of sweet Spanish onions.
Diss. Abstr., 1960, **21**: 1324, being *L.C. Card No. Mic.* 60-5207 of 148 pp.

In small replicated plots purple blotch or leaf blight of onions was most satisfactorily controlled by Dyrene, Oleocuivre and maneb, at 2 lb./100 gal. applied at 5-day intervals for about 6 weeks. *Botrytis* neck rot was partially controlled by summer sprays of Dyrene and Oleocuivre. [See also *H.A.*, 29: 3641.] Storage rots were not reduced by post-harvest fungicidal dips, by disinfection of the shears during topping, by hot-air or infra-red treatment of the bulbs, by fumigation of the bulbs with methyl bromide or by waxing of the bulbs after a fungicidal dip.—Cornell Univ.

4598. PETROVA, Z. I.
Disinfection of the soil against stem nematodes. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(5): 28.

Of several soil fumigants tested against *Ditylenchus allii* dichloroethane, DD and DDIB (dichloroisobutane, dichloroisobutylene) injected to a depth of 10–12 cm. gave the best control. Onion seeds sown 20 days after treatment with dichloroethane germinated and grew normally, but sowing 32 and 36 days after DD and DDIB resulted in poor emergence.

4599. RYGG, T.
Løkflue (*Hylemyia antiqua* Meig.). Undersøkelser over dens biologi og bekjempelse i Norge. (**Studies on the life history and control of the onion fly in Norway.**) [English summary 4 pp.]
Meld. Stat. Plantevern **18**, 1960, pp. 56, bibl. 41, illus.

Several parasites of the onion fly have been found, of which *Aleochara bilineata* is probably the most important. Seed dressings of aldrin or dieldrin at 50 g. active ingredient per 1 kg. seed have effectively controlled fly attacks. A liquid gum was used as the wetting agent. Dipterex was not effective as a seed dressing and also reduced germination in some cases. Dusting the rows with an insecticide before sowing or germination was less effective than seed dressings. The recommended treatment for sets is pre-planting immersion in a chlorinated hydrocarbon emulsion. Root dips before planting were phytotoxic.

4600. ANON.
Combate del trips o piojito de la cebolla. (**Control of onion thrips.**)
Not. agríc. Serv. Shell Agric., Venezuela, 1961, **2**: 100, illus.

Satisfactory results against *Thrips tabaci* have been given by 3% BHC dust, alone or mixed with an equal quantity of sulphur, using 30–50 kg. of powder per ha., and also by spraying with 46·7% parathion at 0·5 l., or with 57% malathion at 1 l., per ha., the dilution with water depending on the type of equipment used.

4601. MORALES M., E., AND MATARRITA A., A.
El piojito y el pulgón de la cebolla y su control químico. (**Onion thrips and aphids and their chemical control.**)
Suelo Tico, 1960, **12**: 77-89, bibl. 10, illus.

Thrips tabaci was very satisfactorily controlled in onion crops by aldrin at 0·15–0·25%, and good, but slightly less effective action was shown by DDT at 0·5%. Bulb weight and yield were significantly increased by aldrin, chlordane, DDT and BHC, applied 3 times fortnightly after emergence. Systemic insecticides were very effective against aphids (*Micromyzus formosanus*). For combined treatment a mixture of aldrin with diazinon or Metasystox is recommended. Folidol gave good results if applied weekly.

4602. BRUDER, J.
A dughagyma tárolási hőmérsékletének hatása az étkezési hagyma terméseredményére és a magszár képződésére. (**The effect of temperature during the storage of sets on the productivity and bolting of onions.**) [Russian and German summaries ⅓ p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(4): 21-8.

Treatment of onion sets at 35–40° C. for up to 60 days, depending on their size, reduced bolting and substantially increased yields. The best time for this treatment was immediately before planting, but, where treatment had to be done earlier, the treated sets could be stored at 18° C. for the remaining period. A temperature range of 10–15° C. before or after planting reduced the inhibitory effect of heat treatment on bolting.

4603. Patil, J. A.
Onion storage.
Poona agric. Coll. Mag., 1960, **51**(2): 33-43, bibl. 7.

In winter-grown onions maximum loss in weight occurred in the first month of storage; there was no difference in loss attributable to bulb size, but small bulbs were more apt to rot and large bulbs to sprout. Greater storage losses were found in monsoon-grown varieties, white-skinned types showing the highest loss and being more susceptible to storage diseases. Pre-harvest sprays of 200–300 p.p.m. MH reduced shrinkage of bulbs during storage.

4604. Yamada, Y.
Studies on the differentiation and development of the off-sets and flower buds in *Allium fistulosum* L. var. *viviparum* Makino. [Japanese, with English summary 1 p.]
Agric. Bull. Saga Univ., 1960, No. 11, pp. 129-51, bibl. 14, illus.

A detailed study of the developmental morphology of the parent plant, tillers and aerial bulbils.

4605. Eguchi, T., and others.
Studies on seed production in the Welsh onion (*Allium fistulosum* L.). Part 1. On flower bud differentiation and development in the Welsh onion. Part 2. Investigations on flowering in the Welsh onion. Part 3. Influence of nitrogenous fertilizers applied at different stages on the yield and quality of seeds in the Welsh onion. [Japanese, with English summaries.]
Bull. nat. Inst. agric. Sci. Hiratsuka, Ser. E, 1958, No. 7, pp. 107-14, bibl. 3, illus., 115-32, bibl. 27, illus., 133-44, bibl. 21.

Differentiation of the first umbel began in November and that of flower buds in December. Flower primordia differentiation in the first umbel ceased at the end of March. Bolting generally lasted from 25 March to 5 April and flowering began from early to mid-April. Flowering lasted about 20 days, the first umbel lasting longer than the second. A significant correlation was found between the number of florets in the first and second umbels, and also between the date of flowering and the length of the flowering period. More florets were produced with higher temperature or lower humidity. Dehiscence was also affected by climate. Applications of nitrogenous fertilizers at various stages did not affect the dates of bolting, flowering, flowering period, number of seed stalks per plant, percentage fruit set, weight of 1,000 seeds and percentage germination of seeds, but applications in late February and early March, and also at the time of flowering, increased the total number of florets and capsules and also the yield of seeds per plant.

4606. Medina B., J., and Cásseres, E. H.
Effect of varieties and of size of cloves on yield of garlic in Mexico. [Spanish summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 67-72, illus.

Cloves of the Chileno and Criollo varieties were separated into 3 sizes before planting. In both cases plants from the large cloves were higher yielding than those from medium and small cloves. Chileno was more productive than Criollo.

4607. Anon.
Combate del nematodo del ajo. (**Control of the garlic nematode.**)
Not. agríc. Serv. Shell Agríc., Venezuela, 1960, **2**: 81-2, illus.

Of the 3 Venezuelan garlic varieties Andino and Mejicano are very susceptible, and Criollo is more resistant, to *Ditylenchus dipsaci*. Cloves are disinfected by placing them for 24 hours in a 1% solution of Phosdrin. For soil fumigation DD is applied by hand lance at 4 c.c. per injection and 30 × 30 cm. spacing (400 l./ha.).

4608. Yamada, Y.
On the relation between the cultivation temperature and effects of cold storage of bulbs of Japanese garlic (*Allium sativum* var. *japonicum* Kitamura). I and II. [Japanese, with English summaries ¾ p. each.]
Agric. Bull. Saga Univ., 1959, No. 8, pp. 23-33, bibl. 6, illus., and No. 9, pp. 79-90, bibl. 20, illus.

Storage of cloves at 5–7° C. for 60 days before planting resulted in the differentiation of seed stalks and bulbs 50 days earlier than in untreated cloves when they were grown in the open, and in differentiation 70 days earlier when they were grown in a cold greenhouse. Cultivation in hothouses at 20° or 25° C. resulted in suppression of the seed-stalk and bulb formation. In other experiments with cloves stored at −1·5° to 4·5° C. for 78 days before planting, subsequent cultivation at 15° or 20° C. resulted in seed-stalk suppression and the formation of abnormal bulbs in 87 and 96% of the plants, respectively. At 25° C. none of the plants flowered and all produced abnormal bulbs.

4609. ALFONSO, N., AND LÓPEZ, E.
Determination of the odour value of Mexican garlic.
Z. LebensmittUntersuch., 1960, **111**: 410-13, from *Anal. Abstr.*, 1960, **7**, Abstr. 4477.

A method is described of determining the pyruvic acid formed when alliin, the parent substance of the odoriferous principle allicin, is broken down by the natural enzyme of the plant.—Inst. Méx. Invest. Tecnol.

4610. VERLAAT, J. G.
Chemische onkruidbestrijding op preizaaibedden. (**Chemical weed control in leek seed-beds.**)
Groenten en Fruit, 1960, **15**: 1088-9.

Results of trials on 3 sowing methods for leeks, to be treated with herbicides, indicated the superiority of row drilling and compressing the soil over broadcasting with or without raking and compressing the soil. For immediate post-sowing treatments 40–50 ml. 40% chlorpropham in 4–8 l. water per are was found suitable. As a pre-emergence treatment PCP in oil, sulphuric acid and herbicidal oils were satisfactory. For post-emergence treatment, when the leeks were 6–8 cm. high, chlorpropham, DNOC and dinoseb were suitable.—Proefst. Groenteteelt, Alkmaar.—From *Weed Abstr.*, **9**, No. 1924.

Rhubarb.

4611. N.S.W. DEPARTMENT OF AGRICULTURE, BIOLOGY BRANCH.
Diseases of rhubarb.
Agric. Gaz. N.S.W., 1960, **71**: 470-3, illus.

Symptoms and control of downy mildew, leaf spot, rust, crown rot, and *Sclerotium* stem and stalk rot.

Root crops.

(*See also* 3662, 3666, 3678, 3709, 3710, 3739, 3757, 3761, 3779, 4064, 4160, 4388, 4405, 4407, 4409, 4414, 4502, 4526, 4581, 5560.)

4612. HALL, B. J.
Weed control in beetroot and silver beet.
Proc. 2nd Aust. Weeds Conf., *1960*, Pap. 20, pp. 6.

Beetroot: Of several herbicides tested pre-emergence, CDEC at 6 lb./ac. was the most effective and is now in commercial use. *Silver beet:* Results were unsatisfactory.—Hawkesbury agric. Coll., Richmond, N.S.W.—From *Weed Abstr.*, **10**, No. 250.

4613. AKI, S.
Effect of gibberellin on breaking the dormancy of Kintoki carrot seeds. [Japanese, with English summary ½ p.]
Tech. Bull. Fac. Agric. Kagawa, 1960, **12**: 73-7, bibl. 25.

Soaking carrot seeds for 3 hours in 50 or 100 p.p.m. GA was very effective in breaking dormancy and in increasing the germination percentage. The effect was most marked with immature seeds and at low germination temperatures, and it was less evident after long storage. In seeds from which the pericarp or hairs had been removed GA was effective only in increasing the percentage germination. GA was more effective with seeds germinated in diffused light than in darkness.

4614. ROBERTSON, J. A.
Pre-emergence weed control in carrots.
Proc. 2nd Aust. Weeds Conf., *1960*, Pap. 46, pp. 2.

Propazine at 4 lb./100 gal./acre applied to 4 carrot varieties immediately after sowing gave practically complete weed control for 14 weeks, increased yields, did not affect root shape and caused no definite tainting.—C.S.I.R.O., Canberra.—From *Weed Abstr.*, **10**, No. 249.

4615. WARREN, G. F.
New chemicals that show promise for weed control in carrots.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., *1959*, p. 47.

Karsil (*N*-(3,4-dichlorophenyl)-2-methylpentanamide), Solan (*N*-(3-chloro-4-methylphenyl)-2-methylpentanamide) and Dicryl (*N*-(3,4-dichlorophenyl)methacrylamide).—From *Weed Abstr.*, **9**, No. 1925.

4616. VIDME, T., AND JAKOBSONS, P.
Forsøk med kjemiske midler mot ugras a gulrot, 1951-55. (**Trials on chemical weed control in carrots, 1951-55.**) [English summary 1¼ pp.]
Forskn. Landbruk., 1960, **11**: 351-65, bibl. 10.

Increases in the yield of first-grade carrots after chemical spraying (with mineral oils or sulphuric acid) plus hand weeding ranged from 5% to 25% compared with hand weeding alone. Spraying reduced the time required for hand weeding by 31–85%. Ordinary white spirit, bought locally, was as effective as Shell Weed Killer and Esso Weed Killer 35; diesel oil was also effective, but there was a risk of tainting. A single spray was effective when white spirit or herbicidal oils were applied when the carrots had developed one or two true leaves. Mineral oils, applied pre-emergence and at the 1- or 2-leaf stage, were the most effective and gave the highest yield increases. With 2 post-emergence applications of mineral oil yields were invariably lower than with 1 application; there was also a risk of tainting and a tendency for the percentage of defective roots to increase. When spraying was left until 4 or 5 weeks before harvesting, tainting was noticeable in 3 out of 9 trials. The "pencil" stage was the latest stage at which spraying could be done without risk of tainting. Weed control with white spirit was good to very good, providing the weeds were sprayed early enough. Sulphuric acid should be applied not later than 2 or 3 days before germination.—Statens Plantevern, Vollebekk.

4617. Camargo, L. de S.
Influência de calcário na produção de cenoura. **(Effect of lime on carrot yields.)** [English summary 17 lines.]
Bragantia, 1960, **19**: xxxv-xl, bibl. 1.

The yields of carrots sown 11 weeks and 6, 12 and 18 months after liming an acid soil (pH 5·0) with 250 or 500 g. 48% CaO per sq. m. were invariably much higher than those of the controls in unlimed soil; the increases ranged from 19 to 99%. With the first sowing after liming yields were better with the lower rate of liming, but in the subsequent sowings the higher rate gave better yields.

4618. Tasmania Department of Agriculture, Plant Pathology Division.
Diseases of carrots and parsnips.
Tasm. J. Agric., 1961, **32**: 63-7, illus.

Common ailments in Tasmania and their control: important diseases are caused by motley dwarf virus, nematodes and parsnip canker (*Itersonilia perplexans*).

4619. Carlson, E. C.
New insecticides for lygus bug control on vegetable seed crops.
J. econ. Ent., 1960, **53**: 767-71, bibl. 5.
New insecticides for *Lygus* bug control in seed production from table beet and carrot.
Calif. Agric., 1961, **15** (4): 8-9.

DDT, ethion, Dylox, Thiodan, Trithion and Disyston were applied alone and in various combinations to beetroot and carrot seed plants for the control of *Lygus hesperus*. In beetroots a spray containing DDT plus Dylox was most effective, giving 78% control during a 28-day period. Thiodan plus Dylox was almost as good, followed by 5 sprays of Disyston, 5 dustings of DDT plus Trithion, a single spray of DDT plus Trithion or a single spray of DDT. All applications containing Thiodan, as well as the one containing DDT plus Dylox, were more toxic to the predaceous pirate bug, *Orius tristicolor*, than other materials. DDT plus Dylox had no perceptible effect on the beneficial ladybeetles, *Hippodamia* spp., but sprays of Disyston drastically reduced their numbers. DDT plus Trithion dust increased aphid and ladybeetle populations. The best treatments for lygus bug control also increased the average size and viability of beet seeds, and in most cases the average yield of seed per plant. In carrots dusts applied twice by aeroplane for lygus bug control were, in decreasing order of effectiveness: 10% DDT plus 5% Dylox, 3% Thiodan, 10% DDT plus 2% Trithion, and 10% DDT. Improvements in the weight, yield and viability of carrot seeds were more marked in the third- and fourth-stage seed heads than in the first- and second-stage heads. [From author's abstract. For earlier work, see *H.A.*, 30: 730 and 733.]—Univ. Calif., Davis.

Spinach.

(*See also* 3687, 3783, 5593.)

4620. (Webb, R. E.)
Spinach lines that offer advantages.
Agric. Res., Wash., 1960, **9**(6): 12-13, illus.

The new lines are immune to 2 races of blue mould and mosaic and produce only female plants.

4621. Rodenburg, C. M.
A cheap method of testing spinach plants for blue mould resistance during the summer months. [Dutch summary 6 lines.]
Euphytica, 1961, **10**: 31-4, bibl. 1, illus.

This consists of a plastic-covered, wire-mesh tent placed on a concrete floor and sprayed from above by water cooled to about 12° C. This provides temperature and humidity conditions suitable for the growth of *Peronospora spinaciae* on potted test plants.—Inst. hort. Plant Breed., Wageningen.

4622. Jauhari, O. S., Singh, R. D., and Dikshit, V. S.
Preliminary studies on the effect of gibberellic acid on growth of spinach (*Spinacia oleracea*).
Curr. Sci., 1960, **29**: 484-5, bibl. 3, illus.

Spinach seedlings were sprayed with 0, 10, 25, 50, 100 and 250 p.p.m. GA 40, 55 and 70 days after sowing. Maximum increases in the height, the number of leaves, and fresh and dry weights were obtained at 10 p.p.m.—Govt agric. Coll., Kanpur.

Sweet and red peppers and eggplants.

(*See also* 4448, 4681, 5260.)

4623. Smith, I. D. W.
Peppers and eggplants.
Publ. Ont. Dep. Agric. **196**, revised 1960, pp. 5.

Notes on varieties, culture, harvesting and storing.

4624. Aleksić, D.
Indukcija tetraploidije kod paprike. **(The induction of tetraploidy in peppers.)** [German summary $\frac{3}{4}$ p.]
Arh. poljopr. Nauke, 1960, **13**(41): 106-13, bibl. 6, illus.

Tetraploidy was induced in *Capsicum annuum* by treatment with 0·8% colchicine, and the F_1 and F_2 generations were compared with diploid plants. The tetraploids were more vigorous with larger leaves, flowers and seeds. Their flowering and fruiting periods were longer. Fertility in the first 2 generations was rather low but is expected to improve in later generations. The fruits were smaller and lighter and had thicker flesh and higher dry matter contents than the fruits of diploid plants.

4625. MARINKOV, E.
A new hybrid of sweet pepper showing heterosis. [Bulgarian, with Russian and French summaries ⅓ p. each.]
Nauč. Tr. visš. Selskostop. Inst. G. Dimitrov, Sofia, 1960, **8**: 319-25, bibl. 4, illus.

Hybrids between the late capsicum variety Ratund Zelen [= round green] No. 1071 and the mid-season variety Kalinkov 800/7 were in many ways superior to the parent varieties. The yields were higher and the fruits were longer and of better quality, with firmer, more juicy flesh, and were more suitable for transport and storage.

4626. NAGARATNAM, A. K., SIVAGNANAM, L., AND SUBRAMANIAN, A.
Fused fruits in chillies (*Capsicum annuum*, L.).
Madras agric. J., 1960, **47**: 488, illus.

An abnormal condition described.

4627. MELIKOVA, S. A.
Black spot on pepper fruits. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(1): 54.

Spraying 3-4 times with 1% bordeaux reduced infection by *Pseudomonas syringae* var. *capsici* from 33 to 16·5%. [See also *H.A.*, 29: 553.]

4628. KAPELLER, K.
Védekezési kísérletek új növényvédőszerekkel a fűszerpaprika rizoktóniás palántavésze ellen. **(Experiments with some new chemicals on the control of seedling blight of red pepper.)** [English and Russian summaries ¾ p. each.]
Növénytermelés, 1960, **9**: 369-74, bibl. 10, illus.

The effects of 4 new preparations, applied to the soil in seed-beds, on the development of *Rhizoctonia solani* in seedlings of a sweet and a hot variety of red pepper were compared with those of ferri-dimethyldithiocarbamate and zinc oxide. None of the new preparations was more effective than ZnO, and only one, a formulation of chloronitrobenzene, was better than the dithiocarbamate, and this compound was phytotoxic to the pepper seedlings.—Agric. Res. Inst., Kalocsa.

4629. TOUZEAU, J.
Essais de détermination des doses de soufre efficaces contre le blanc du piment (*Oidiopsis taurica*). **(Experiments to determine the rates of application of sulphur effective against red pepper mildew (*Oidiopsis taurica*).)**
Rapp. Activ. Exp. Déf. Cult. 1959, No. 4, pp. 83-6.

Reducing the concentration of sulphur from 350 to 300 or 250 g./hl. resulted in corresponding yield reductions of red pepper in Tunisia. Sublimed sulphur applied as a dust was less effective than micronized sulphur sprays.

4630. BURBUTIS, P. P., AND OTHERS.
European corn borer control in peppers.
J. econ. Ent., 1960, **53**: 590-2, bibl. 3, illus.

In recent years heavy infestations of *Pyrausta nubilalis* in peppers have greatly reduced yields and in addition rendered some affected fruits unsaleable. In field experiments in 1959 excellent control was obtained by DDT w.p. or emulsion at 1 or 2 lb. per acre plus a sticker (Plyac), applied at 10-day intervals. Sevin w.p. at 2 lb. per acre was also very effective. In addition to controlling the borer DDT and Sevin afforded a high degree of protection from larvae of the tobacco hornworm (*Protoparce sexta*) and cabbage looper (*Trichoplusia ni*). Populations of green peach aphids (*Myzus persicae*) became very high during August and September, especially in the DDT treatments, and could not be controlled by malathion.—Univ. Del., Newark, and Univ. Md, College Park.

4631. HOFMASTER, R. N., BRAY, D. F., AND DITMAN, L. P.
Effectiveness of insecticides against the European corn borer and green peach aphid on peppers.
J. econ. Ent., 1960, **53**: 624-6, bibl. 2.

Results are given of 2 experiments, each consisting of 13 treatments. Four weekly applications of DDT, Sevin, phosphamidon and Guthion at 1 lb. per acre were quite effective in reducing the degree of infestation of second brood *Pyrausta nubilalis* larvae on sweet peppers. None of the treatments had any appreciable effect on fruit size or yield. Against third generation borers 7 applications of *Bacillus thuringiensis* spores at 4 lb. per acre were ineffective. Dimethoate, phosphamidon, Guthion, endrin and Thiodan held *Myzus persicae* in check, whereas a heavy aphid infestation developed in the DDT, Sevin and *Bacillus* treatments. [From authors' abstract.]—Va Truck Exp. Stat., Painter.

4632. MENZER, R. E., AND OTHERS.
DDT residue studies on peppers.
J. econ. Ent., 1960, **53**: 622-4, bibl. 3.

On experimental plots of peppers, treated against *Pyrausta nubilalis*, residues of DDT were considerably higher on the plants than on the fruit. Doubling the dosage did not necessarily result in doubling the residue on either plants or fruit. At 1 lb. per acre the immediate average amount of DDT residue on fruit did not exceed the tolerance set (7 p.p.m.); at 2 lb. per acre the tolerance was exceeded. Seven days after treatment the average amount of residue was below the tolerance except at the 2 lb. rate with sticker-spreader added. Residues of DDT on the fruit were reduced by processing, and residues in the canned product were below the tolerance for the raw product. Seven days after treatment the residues on pepper fruits sprayed with air blast equipment at 2 lb. per acre were well below the tolerance set for DDT. [Authors' abstract.]—Univ. Md, College Park, and elsewhere.

4633. Rajki-Cicer, E.
Vegetative hybrids of eggplant (*S. melongena*). [Russian, with English and French summaries 2¼ pp. each.]
Acta agron. hung., 1960, **10**: 267-92, bibl. 22, illus.
Tojásgyümölcs (*S. melongena* L.) vegetatív hibridek. (**Vegetative hybridization in the eggplant.**) [English and Russian summaries about 4 pp. each.]
Növénytermelés, 1960, **9**: 205-30, bibl. 22, illus.

Contrasting varieties, a purple (ssp. *occidentale* var. *bulgaricum*) and a white (ssp. *spontaneum* var. *leucoum*) were used in this investigation. On a rootstock in the 7–8-leaf stage scions were grafted when (a) only the arch of the hypocotyl was visible, (b) the hypocotyl was erect and the cotyledons were unfolded and (c) the primary leaves had appeared. In addition, with both stock and scion in the 7–8-leaf stage grafting was carried out by (d) double coupling, (e) coupling of the axes and (f) gradual exchange of leaves. Method (f) was completely unsuccessful. The percentage of take in (a) was 41·3, in (b) 47 and in (d) and (e) 83·3–100. Of the plants produced when seedlings were used as scions 13·5% showed changes in the scion, mainly in the colouration of the fruit, and the progeny produced from their seed showed great diversity, indicating that segregation with respect to several characters had occurred. This segregation was somewhat different from that found when generative hybrids were studied.—Agric. Res. Inst., Martonvásár.

4634. Campbell, J. S., and Hodnett, G. E.
The effect of spacing on the yield of egg plant (*Solanum melongena*).
Trop. Agriculture, Trin., 1961, **38**, 83-6, bibl. 6.

In tests of square spacings ranging from 18 to 36 in. closer spacing resulted in increased yields and larger net cash returns, without affecting fruit quality. The response to N was more marked with closer spacing.—I.C.T.A., Trinidad.

4635. Arnoux, M., and Messiaen, C. M.
Essais de désinfection du sol contre la verticilliose de l'aubergine. (**Soil disinfection trials for the control of *Verticillium* wilt in eggplants.**)
Phytiat.-Phytopharm., 1960, **9**: 115-21, bibl. 3.

In a greenhouse trial chloropicrin gave the best control of *Verticillium albo-atrum* followed by Formol and thiram. In a subsequent field trial soil injection with 50 c.c. chloropicrin per sq. m., at 15 cm. depth and a spacing of 25 × 25 cm. 3 weeks before planting, gave a significant yield increase of 18%.

Tomatoes—general.

(*See also* 3629, 3800, 4735, 5561, 5574.)

4636. Carncross, J. W. (Editor.)
American tomato yearbook, 1961.
C. Stedman Macfarland, Jr., 8 Elm St., Westfield, New Jersey, 1961, pp. 43, sub. price $2.00.

This latest yearbook closely follows the pattern of its immediate predecessor [*H.A.*, 31: 784]. As a guide to the facts and figures of the tomato industry in the U.S.A. and Canada it has no rival. In addition, the lists of recent references and of names and addresses of individuals conducting research on tomatoes will be of value to everyone wishing to keep abreast of scientific progress in this important crop.

4637. Clements, R. F.
Double cropping can bring higher returns.
Grower, 1961, **55**: 327-8.

Growing 2 crops of tomatoes in a heated dutch-light structure, with the second crop interplanted while the first crop is fruiting.

4638. Zanotti, L.
Pomodoro "fuori tempo". (**Tomatoes out of season.**)
Ital. agric., 1961, **98**: 59-70, illus.

Italian production and trade figures are discussed, and the earliest varieties are enumerated. Genetical and nutritional factors affecting disease resistance are briefly discussed.

4639. Orphanides, J. P.
Vegetable production under plastic covers.
Countryman, Nicosia, Nov.-Dec. 1960, pp. 18-19.

In areas with a mild climate protection of tomatoes, melons and cucumbers with plastic covers increased earliness by 15–30 days.

4640. Campbell, J. S., and Bharath, S.
The improvement of cultivation methods in tomato growing in Trinidad. [Spanish summary ⅓ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 87-95, bibl. 10.

Local methods of cultivation are discussed. Suggested improvements include the selection of improved varieties, the use of seedlings raised under open-sided greenhouses in 3-in. pots or transplanted at an early stage at a 3 × 3 in. spacing in an open seed-bed, ridge planting, the greater use of fertilizers and improved pest and disease control. More consistent results may be achieved by planting in soil or aggregate under open-sided greenhouses covered with glass or polythene. Varieties suitable for this method, their cultivation, spacing, watering, pest and disease control, the use of hormone sprays and hydroponic production are also discussed.—I.C.T.A., and Minist. Agric. Trinidad.

Tomatoes—breeding and varieties.

(*See also* 4346, 5568.)

4641. Kataoka, S.
Studies on the breeding of vegetable fruits. (I) Tomato and (II) Cucumber. [Japanese, with English summary 1½ pp.]
Bull. Fac. Agric. Tamagawa, 1960, No. 1, pp. 47-59, bibl. 7.

Intervarietal relationships were studied in tomatoes and cucumbers. The number and average weights of harvested fruits and the temperatures at which they ripen were found to be related. Production of small or large fruits were inherited characteristics. Dwarf varieties produced lower yields than tall varieties owing to lower assimilation. Factors influencing the total weight of crop are discussed. In both long- and short-day Japanese spring cucumbers the height of plant, number of nodes on the vines and quantity of harvested fruit were shown to be related. Flowers with single pistils were found at each node except the third to the tenth nodes from the root.

4642. Campbell Soup Company.
Proceedings Plant Science Seminar, Camden, N.J., 1960, 1960, pp. 162, bibls, illus.

The papers presented at this meeting all had a common theme, namely the breeding of tomatoes resistant to diseases and other troubles. The articles are: Control of important viral diseases of tomatoes by the development of resistant varieties, by F. O. Holmes; The development of anthracnose resistant tomatoes, by A. D. Hoadley; Host pathogen relationships with tomato anthracnose disease, by R. A. Ludwig; Breeding of disease resistant tomatoes with special emphasis on resistance to nematodes, by A. L. Harrison; The chemical basis of modern genetics, by G. W. Beadle; Breeding tomatoes for resistance to fruit cracking, by G. B. Reynard; Resistance to the late blight fungus in tomato, by M. E. Gallegly; Quality criteria and their evaluation in a breeding program for processing type tomatoes, by D. R. Porter; and Important problems that plant breeders need to solve, by M. W. Parker.

4643. Walkof, C.
Improvement of tomato fruit size and maturity by backcross breeding.
Canad. J. Plant Sci., 1961, **41**: 24-30, bibl. 10.

A co-operative project, involving 9 research institutions, which has been highly successful.

4644. Horváth, E.
A kecskeméti heterózis paradicsomnemesítés gyakorlati eredményei. (**Practical results of breeding hybrid tomatoes in Kecskemét.**) [English and Russian summaries ¾ p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(4): 9-19, bibl. 22.

Between 1952 and 1958 some 600 hybrid combinations were produced, among which were several outstanding for high yield and early ripening.

4645. Alpat'ev, A. V., and Jur'eva, N. A.
Distant hybridization in tomato breeding. [Russian.]
Vestn. sel'sk. Nauki, 1960, **5**(12): 40-2.

Including crosses between tomato and *Cyphomandra*-tomato hybrids and between tomato and *Solanum racemigerum*.

4646. Langridge, J., and Brock, R. D.
A thiamine-requiring mutant of the tomato.
Aust. J. biol. Sci., 1961, **14**: 66-9, bibl. 8, illus.

A single-gene mutant unable to synthesize thiamine.

4647. Barbieri, R.
Il miglioramento delle varietà di pomodoro. (**Selection of tomato varieties.**)
Inf. Ortofruttic., 1960, **1**: 215-17, illus.

Among tomato varieties for canning, San Marzano has degenerated into mixed strains, partly by natural crossing with Lampadina which has largely replaced it. Attempts are being made to select and fix those strains which most closely resemble the original San Marzano (in which fruit quality was higher than in Lampadina) and are disease resistant [see also *H.A.*, 30: 2318]. The numerous varieties of table tomato grown in Italy are listed. The possibility of obtaining types resistant to fruit cracking is being investigated, using hybrid seed.

4648. Stevenson, E. C., Tomes, M. L., and Johnson, K. W.
New tomato varieties.
Report, Purdue Univ., 1960, **3**(2): 11.

Stair, recommended as a replacement for Rutgers for whole-pack canning, is resistant to *Fusarium* wilt, uniform in size throughout the growing season, more resistant to cracking than current varieties, similar in vine length and maturity to Rutgers but with slightly smaller fruit. Tecumseh, which is highly resistant to *Fusarium* wilt and also grey leaf spot, resembles Urbana in vine size and fruit characteristics but is more prolific. It is recommended as a replacement for Urbana for use for tomato juice and other products. The performance and derivation of both varieties are reported. [See also *H.A.*, 31: 2564.]

4649. Campbell, J. A.
Vine ripe tomato varieties tested.
Miss. Fm Res., 1960, **23**(11): 5, illus.

Trials of 10 varieties over 2 years have shown Marion, Kokomo and Indian River to be superior in yield and other important characteristics.

4650. Tomes, M. L., and others.
The derivation, culture, and utilization of Epoch, a dwarf tomato variety.
Res. Bull. Purdue Univ. agric. Exp. Stat. **701**, 1960, pp. 7, bibl. 1, illus.

This variety, which is resistant to *Fusarium* wilt, was bred for the processing industry. The results of field trials made over a 3-year period are outlined, and recommendations are made on methods of cultivating Epoch, with particular reference to ways in which these differ from cultural methods used for standard varieties.

4651. Honma, S., Wittwer, S. H., and Heeckt, O.
Spartan Red 8, a new tomato for greenhouse production.
Quart. Bull. Mich. agric. Exp. Stat., 1961, **43**: 478-81, bibl. 3, illus.

An early variety, which can set fruit at high temperatures. Its characters include closely spaced clusters, uniform ripening, relatively little cracking and the production of good yields under adverse conditions.

4652. Ananjan, A. A.
Tomato varieties for the processing industry. [Russian.]
Vestn. sel'sk. Nauki, 1961, **6**(1): 37-40, illus.

Breeding methods used in Armenia and descriptions of 5 new varieties.

4653. Sillona, G.
Performance test and selection of tomato hybrids for wet season.
Araneta J. Agric., 1960, **7**: 94-115, bibl. 7, illus.

The F_1 back-cross Laguna × Pearl Harbour-Laguna was the most prolific of all the varieties and hybrids grown in the wet season and was resistant to both the rain and the 28-spotted beetle. DDT 50% w.p. proved effective against this pest.

4654. Slepneva, G. S.
Promising varieties of tomatoes for the Krasnojarsk region. [Russian.]
Vestn. sel'sk. Nauki, 1960, **5**(9): 76-8.

Some new, early ripening, low growing, drought resistant varieties are described.

4655. Vinogradov, P. I.
Development of early ripening, cold resistant varieties of tomato in Moldavia. [Russian.]
Agrobiologija, 1960, No. 3, pp. 356-60.

Tomato seedlings were selected for cold resistance and for early ripening after planting out early in the season. Harvests were obtained 10–20 days earlier and total yields were increased 1·5 times by planting selected varieties in April. The selected varieties differed from standard varieties in their period of active growth, the formation of maximum assimilating surface and their ability to accumulate carbohydrates and different N fractions.

Tomatoes—environment, growth and physiology.

(*See also* 3654, 3671, 3673, 3694, 3710, 3794, 3813, 3822, 4639.)

4656. Moškov, B. S., and others.
The use of MLA lamps in vegetable growing. [Russian, with English, French and German summaries 9 lines each.]
Vestn. sel'sk. Nauki, 1960, **5**(10): 96-9, bibl. 1.

Tomatoes and cucumbers were grown in artificial light provided by 3 types of lamp. Although incandescent lamps with reflectors produced the greatest yields and highest vitamin C, sugar and dry matter contents, mercury luminescent arc lamps were a more economical source of light and were simpler to instal and operate. Forty-watt fluorescent lamps produced the poorest growth and lowest yields.

4657. Moschini, E.
Ricerche sulla concimazione carbonica del pomodoro coltivato in serra. **(Studies on the carbon nutrition of glasshouse tomatoes.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 436-58, bibl. 47, illus.

Pumping carbon dioxide gas between rows of tomato plants in a glasshouse for 4 hours on each fine day in February, and for 4 hours every day in March and April increased plant growth, chlorophyll production, the number and weight of fruits and the total yield. The effect on yield was particularly marked at the beginning of the season. Harvesting was not significantly advanced by the treatment.—Univ. Pisa.

4658. Stolzy, L. H., and others.
Influence of soil-oxygen diffusion rates on susceptibility of tomato plants to air-borne oxidants.
Soil Sci., 1961, **91**: 151-5, bibl. 9, illus.

Tomato plants growing in sealed containers of soil with different oxygen diffusion rates were subjected to air-borne oxidants for short periods of time. The supply of oxygen to the plant roots influenced the susceptibility of the plants to air-borne oxidants. Plants growing in soils with oxygen diffusion rates of 16 to 24 × 10^{-8} g. per sq. cm. per min. were not damaged by peroxyacetyl nitrate (PAN) or ozone, but at 34 to 90 × 10^{-8} g. per sq. cm. per min. plants were moderately to severely damaged by both PAN and ozone. At the lower-oxygen treatments water-use data and plant symptoms were an indication of reduced plant vigour. Measurement of the soil oxygen diffusion rates in field plots showed that limited oxygen supply to plants could affect the susceptibility of the plants to air-borne oxidant damage under field conditions. [From authors' summary.]—Univ. Calif., Riverside.

4659. Baluškin, L. N.
Absorption of water vapour by tomato and potato leaves. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **134**: 1484-5, bibl. 2.

Water was absorbed at high R.H. in both light and darkness.

4660. Krüger, W.
The influence of antibiotics on the germination of tomato seed and development of the seedlings. [Afrikaans and French summaries ⅓ p. each.]
S. Afr. J. agric. Sci., 1960, **3**: 561-71, bibl. 16.

Germination of tomato seeds was hardly affected when high concentrations of antibiotics were used during filter paper tests, and there were no toxic effects on germination in the soil. The antibiotics did penetrate the seed coats, but no measurable quantities were found in the cotyledons, radicle, hypocotyl and plumule. No antibiotics were found in seedlings which were germinated in soil. —Coll. Agric. and Exp. Stat., Potchefstroom.

4661. Row, V. V., Sanford, W. W., and Hitchcock, A. E.
Indole-3-acetyl-D,L-aspartic acid as a naturally-occurring indole compound in tomato seedlings.
Contr. Boyce Thompson Inst., 1961, **21**: 1-10, bibl. 11, illus.

Extracts of 30- to 35-day-old plants contained a stable substance, chromatographically identical to synthetic IAAP. Extracts of plants pretreated with IAA and NAA contained IAA, and considerably more IAAP than extracts of control plants. This is believed to be the first report of naturally-occurring IAAP in plants, and it is suggested that the possible role of IAAP in metabolism should be investigated, especially in plants which have different photoinductive requirements for flowering.

4662. Stanton, D. J.
Further experiments on the treatment of tomato seedlings with n-m-tolylphthalamic acid.
A.R. Cawthron Inst., 1959-60, 1960, pp. 30-1.

Treatments applied to seedlings included spraying when the first true leaf was just emerging (6 July) and again 8 days later, using concentrations of 75 p.p.m. and 150 p.p.m., and spraying on 10 July with 1 spray (150 p.p.m.). Plants receiving 2 sprays at 150 p.p.m. were the most affected. Tolyphthalamic acid greatly increased the number of flowers on the lower trusses, but the number of fruits set was not increased [see also *H.A.*, 30: 5613] and much of the early fruit was very poor. Early yield was delayed and total yield depressed.

4663. de Keyzer, R.
Een nieuw groeistofpreparaat voor tomaten —Duraset. **(A new growth substance for tomatoes—Duraset.)**
Tuinbouwberichten, 1960, **24**: 132-3.

Duraset (containing 19% N meta-tolylphthalamic acid) has been tested in growers' trials to improve fruit set of tomatoes, and the following recommendations are now made: a rate of 1 g./l. is only adequate when sprays are applied regularly at 1–2-week intervals; 2 g./l. should be used when the weather is dull, and to set the bottom truss; 3–4 g./l. should be used when growth conditions do not favour fruit set. Preliminary studies show that Duraset at 1 g./l. also improved flower initiation in young plants. At 4 g./l. Duraset inhibited growth.

4664. Gombkötő, G.
Növényházi paradicsom terméskötésének elősegítése növekedésszabályozó anyagokkal. **(Promoting fruit setting in glasshouse tomatoes by means of growth substances.)** [English and Russian summaries ¼ p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 19-28, bibl. 2, illus.

Weekly spray applications of *p*-chlorophenoxyacetic acid at 30 p.p.m. improved fruit set and increased yields from 54·86 to 75·07 kg. per 50 plants.

4665. Avdonin, N. S., and Kuan' Tin'-Juj.
The effect of gibberellin on the yield, quality and metabolism of tomatoes and lettuce. [Russian, with English, German and French summaries ¼ p. each.]
Vestn. sel'sk. Nauki, 1961, **6**(1): 32-5.

Tomatoes were given 3 sprays of GA at 100 mg./l. after planting and lettuce one spray 2 weeks after sowing. The treatment increased the yield of lettuce by 50% and that of early tomatoes by 34% but did not affect the total yield of tomatoes. GA raised the sugar and vitamin C contents of tomatoes, reduced their acidity and also lowered the protein content of both crops. Enzyme activity in the leaves of both plants was affected. Tomato seed production was greatly reduced, but seed viability was improved.

4666. Homan, D. N.
Hormone transport in the physiology of fruit development.
Diss. Abstr., 1960, **21**: 1345, being *L.C. Card No. Mic.* 60-4376 of 127 pp.

An aqueous solution of IAA injected into the pedicel on the proximal side of the abscission zone was rarely effective in inducing parthenocarpy of tomato fruits, but the injection became more effective as the point of entry came closer to the ovary. After applications of radioactive IAA to the pedicel, much of the hormone accumulated in the abscission zone, and only small and non-stimulatory amounts of IAA were detected in the ovary. Radioactive IAA, when applied to the cucumber pedicel, which has no abscission zone, was readily transported in relatively large amounts to the ovary. In the tomato radioactive 2,4-D was transported to both distal and proximal regions after application to the pedicel, and did not appear to accumulate in the abscission zone. Further studies gave no indication of an IAA-oxidase enzyme acting in the tomato pedicel, and showed no apparent effect of GA, TIBA or 2,4-D on IAA transport in the intact pedicel.—St. Univ. Ia.

4667. KIDSON, E. B.
Chemical investigations on tomato plants in water culture.
A.R. Cawthron Inst., 1959-60, 1960, pp. 27-9.

The activity of polyphenol oxidase was high in young growing tissue of the tomato plant. Young leaves, stems and fruit showed considerable enzyme activity, but this activity declined with increasing maturity. Ripe seeds had lost all activity, but when they germinated, high activity was again found in the root tip and hypocotyl. Polyphenol oxidase activity was high in the roots of well grown plants. Evidence of latent polyphenol oxidase was found in the walls of tomato fruits approaching maturity. The addition of sodium sulphate to the standard culture solution to treble its osmotic pressure effectively reduced cloud [see also *H.A.*, 30: 5617]. Cloud was also reduced when half the Mg in the solution was replaced by equivalent K and Na or when half the Ca was replaced by Mg.

Tomatoes—soil management, irrigation and nutrition.

(*See also* 3646, 3654, 3660, 3667, 3690, 3735, 3913, 4667, 4676, 4684, 5569.)

4668. PUUSTJÄRVI, V.
Turve kasvihuonemultana. (**Peat as greenhouse soil.**)
Puutarha, 1960, **63**: 580-1, illus.

Three peat-nutrient mixtures produced record crops of glasshouse tomatoes (24–33 kg./sq. m.) at the University of Helsinki.

4669. HOPEN, H. J., AND RIES, S. K.
The evaluation of several herbicides applied to tomatoes at different times and locations.
Quart. Bull. Mich. agric. Exp. Stat., 1961, **43**: 581-7, bibl. 17.

The literature is reviewed briefly. Solan (*N*-(3-chloro-4-methylphenyl),-2 methylpentamide) applied at 2 lb./acre as a pre-emergence spray to both direct-seeded and transplanted tomatoes gave good weed control. Granular amiben at 2 and 4 lb./acre and granular CDAA at 4 lb./acre also gave good weed control without injury to the plants.

4670. HERRON, J. W., AND COTTER, D. J.
Effects of post-transplanting herbicidal treatments on tomatoes.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, pp. 46-7.

When applied over the tomatoes 3 days after planting, none of the following injured the tops or reduced yields significantly: simazine at 1 lb./acre, diphenylacetonitrile (Lilly 13489) at 4 and 8 lb./acre, (p-chlorophenyl)phenylacetonitrile (Lilly 09726) at 4 and 8 lb./acre, CDEC at 4 and 6 lb./acre, CDAA at 4 and 6 lb./acre and neburon at 2 and 4 lb./acre. Simazine at 2 lb./acre caused injury and reduced yields, though not significantly. Univ. Ky, Lexington.—From *Weed Abstr.*, **9**, No. 1927.

4671. BURGIS, D. S., AND EVERETT, P. H.
Chemical weed control for commercial vegetable production.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 305-6, illus., and 322.

Tomatoes: EPTC applied before planting at 2 and 4 lb./acre and at 4 and 6 lb./acre at lay-by, and Karmex diuron also at lay-by at 1 lb./acre, significantly reduced annual weeds and grasses without significantly affecting the weight or size of marketable fruits. Solan, EPTC and diuron applied post-emergence at the time of staking gave satisfactory weed control without significantly affecting the crop. Several treatments of EPTC and Karmex-DW were applied in the autumn and spring to unstaked tomatoes on new land. In the autumn both herbicides caused temporary crop injury and a slight yield reduction. In the spring little or no crop injury occurred, and EPTC applied at 5 lb./acre before planting produced the highest yield. *Pole beans:* 4 lb. EPTC/acre raked into the soil at the time of staking is recommended for sandy soils. [See also *H.A.*, 31: 799.]

4672. CHIPMAN, E. W.
Studies of tomato response to mulching on ridged and flat rows.
Canad. J. Plant Sci., 1961, **41**: 10-15, bibl. 12.

Black plastic and sawdust mulches were applied to ridged and flat rows in a 2-year (1956–1957) study. Records were taken of soil temperature and moisture levels, ripe fruit to 31 August and total crop (ripe and green fruit). The highest early yield was obtained from the unmulched and sawdust plots, but the heaviest total yield came from the black plastic plots. Highest soil temperature and lowest moisture readings were recorded under the black plastic, and lowest soil temperature and highest moisture under the sawdust. The earliest ripe fruits came from the flat rows, but the total crop was significantly higher on the ridged rows. There was no significant interaction for mulches and row type. [Author's abstract.]—Canada Dep. Agric., Kentville, N.S.

4673. HEENEY, H. B., MILLER, S. R., AND RUTHERFORD, W. M.
A meteorological method of calculating the irrigation requirement of the canning tomato crop.
Canad. J. Plant Sci., 1961, **41**: 31-41, bibl. 11, illus.

The value and the method of application of the black Bellani plate atmometer for estimating the irrigation requirements of tomatoes was studied between 1955 and 1958. This method was shown to be equal or superior to the other methods of estimating irrigation requirements, including the plaster of Paris soil moisture block. The method was tested in comparison with the soil moisture block procedures over a 2-year period, and the soil moisture and yield results by the two methods compared. The details of the method used are outlined and suggestions made for a further refinement. [From authors' abstract.]—Canada Dep. Agric., Ottawa.

4674. WEBSTER, A. B., AND BOYCE, W. R.
Home-made liquid feeds for trickle-irrigated glasshouse tomatoes.
N.Z. J. Agric., 1960, **101**: 607-12, illus.

See *H.A.*, 31: 2574.

4675. HANDLEY, M. F., AND OTHERS.
Synthetic ion exchanger fertilization of container-grown plants.
Down to Earth, 1961, **16**(3): 2-8, bibl. 9, illus.

Experiments were conducted using greenhouse tomatoes and various ornamentals, especially chrysanthemums, which showed the practicability of supplying sufficient fertilizer in the original potting compost combined with ion exchange resins to maintain the plant for relatively long periods without supplementary feeding. It was found that usually only N, P and K need be added in this way, and that, in contrast to normal composts, the addition of supra-optimal levels of fertilizer did not result in inhibition of growth or salt damage.

Tomatoes—diseases and pests.

(*See also* 3755, 3756, 3760, 3762, 4642, 4653, 5258, 5570, 5587.)

4676. D'JAČENKO, N. I.
Increasing the resistance of tomatoes to mosaic and streak. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(1): 54.

A test of tomato varieties for resistance to mosaic and streak showed that northern varieties are much more resistant than southern varieties. Sowing *in situ* increased resistance by comparison with transplanting, as did raising the seedlings under glass at low temperatures. When seeds were soaked in a nutrient solution containing 0·2% P, 0·2% K and 0·005% Mn, resistance was increased 2- to 2·5-fold, yield by 25–30% and the resistance of the progeny was also greatly improved. Repeated applications of P, K, B, Mg or schoenite [magnesium potassium sulphate] in low concentrations were also effective, and heat treatment of seeds gave almost complete control.

4677. BAZÁN DE SEGURA, C., AND CORRALES M., A.
Comparativo de fungicidas para el control del *Phytophthora infestans* en el cultivo de tomatera. (**Comparison of fungicides for the control of *Phytophthora infestans* in tomato growing.**)
Inf. mens. La Molina, 1958, **32**(372): 1-9, bibl. 3.

Of 7 fungicides compared on Pearson tomatoes Dithane M-22 and Dithane Z-78 gave the best control of late blight and the highest yields. Six applications of 0·25% sprays were made between 30 October and 7 December, 1957, the first at 600 l. per ha. and the rest all at 800. The infection rates (mean of last 3 observations) and the yields per ha. were 4% and 45,748 kg. per ha. with Dithane M-22, 13·93% and 44,303 kg. per ha. with Dithane Z-78 and 39·69% and 27,338 kg. per ha. in the control.

4678. SALERNO, M., AND CALABRETTA, C.
Gravi infezioni da *Phytophthora citricola* Sawada (= *P. cactorum* var. *applanata* Chester) su piantine di pomodoro in Sicilia. (**Heavy infection of tomato seedlings by *Phytophthora citricola* in Sicily.**) [English summary 8 lines.]
Atti Ist. bot. Univ. Pavia, 1960, **18**: 222-33, bibl. 12, illus.

The first report of this fungus from the Mediterranean area and of its appearance on tomatoes.

4679. TOUZEAU, J.
Essai de traitement curatif sur septoriose de la tomate. (**An experiment on curative treatment for *Septoria* infection of tomatoes.**)
Rapp. Activ. Exp. Déf. Cult. 1959, No. 4, pp. 91-2.

In Tunisia copper oxinate at the so-called eradicant concentration of 80 g./hl., applied 4 times from mid-May to mid-June to tomatoes affected by leaf spot (*Septoria lycopersici*), did not significantly reduce the infection. [See also *H.A.*, 30: 3945.]

4680. FÉLIX, S.
Some studies on a disease of tomato new to Mauritius.
Rev. agric. sucr. Maurice, 1960, **39**: 353-6, bibl. 4, illus.

The symptoms, host range and economic importance of *Stemphylium solani* are described. Promising control has been obtained using sprays suitable for blight control.

4681. ANON.
Prevenciones contra la marchitez. **(Precautions against wilt diseases.)**
Not. agríc. Serv. Shell Agric., Venezuela, 1960, **2**: 90-1, illus.

In tomato and capsicum crops wilting, caused by a combination of species of *Fusarium*, *Meloidogyne*, *Pratylenchus*, and possibly *Pseudomonas solanacearum*, was successfully prevented in Venezuela by soil fumigation with DD at 200 l./ha.

4682. TOUZEAU, J.
Étude de la rentabilité d'un traitement nématicide contre l'anguillule des racines de la tomate. **(An economic study of a nematicidal treatment of tomatoes against root knot nematodes.)**
Rapp. Activ. Exp. Déf. Cult. 1959, No. 4, pp. 87-90.

DD injected into the soil at 300 l./ha. 22 days before transplanting tomatoes reduced the average of withered plants from 81 to 23% and increased yields by 150–200% on soils infested by *Meloidogyne incognita*. Under Tunisian conditions the treatment was economic for early and late, but not mid-season crops.

4683. PEACOCK, F. C.
Inhibition of root-knot development on tomato by systemic compounds. [French summary ¼ p.]
Nematologica, 1960, **5**: 219-27, bibl. 16.

Test chemicals added to the nutrient medium did not affect the host/parasite relationship between excised tomato roots and *Meloidogyne incognita*. When chemicals were wick-fed to the stems of intact plants, sodium fluoracetate completely inhibited root-knot development at 100 and 1,000 p.p.m. without phytotoxicity, and fluoracetamide was almost as effective. Other nematicides were too phytotoxic at effective concentrations. Effective foliar sprays of MH, sodium fluoracetate, fluoracetamide and 2,4-dichloroanisole were also somewhat phytotoxic.—I.C.I., Jealott's Hill Res. Stat., Bracknell, Berks.

4684. TRESKOVA, V. S.
Microelements and nematicides in the control of root-knot nematodes. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(5): 26-7.

In pot and field experiments spraying with Cu, Mn and B stimulated the development of tomato plants, increased their resistance to root-knot nematodes, *Meloidogyne* spp., reduced the fecundity of the females and increased yields. Solutions of sodium salicylate and ammonium nitrate applied to the soil were even better in these respects and can be classed as nematicides.

4685. DAMANSKAJA, L. JU.
Measures against root-knot nematodes. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(6): 41.

Vapam produced in the U.S.S.R. (containing 52% active ingredient compared with 31% in the imported material) was applied at 10 to 50 g. per sq. m. of soil and tomatoes were planted 28 days later. Rates of 20 to 50 g. per sq. m. gave good control of nematodes without being phytotoxic.

4686. GARGIULO, A., AND MOYANO, A.
Ensayo de D-D en tomate. **(An experiment with DD on tomatoes.)**
Rev. Fac. Cien. agrar., Mendoza, 1958, **7**: 39-47, bibl. 6, illus.

DD applied at 195·3 l./ha. to furrows in a fine sandy soil between rows of tomato plants gave very good control of the nematode *Heterodera marioni*, and the average yield from plants treated at this and 2 higher rates was 3·56 times as high as from the untreated controls. The application rates were all equally effective, and the lowest rate was economically very satisfactory.

4687. TUKALEVSKIJ, I. M., AND ROGAČEV, V. L.
A new pest of tomatoes and potatoes in the south of the Ukraine. [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(5): 54, illus.

Vasates lycoperisici, controlled by 3 applications of 0·04–0·05% Thiophos.

4688. MICHELBACHER, A. E., AND UNDERHILL, J. P.
Control tests for tomato insects.
Calif. Agric., 1961, **15**(5): 13.

Three dusts of 10% toxaphene, 5% Sevin + 75% sulphur, 5% DDD + 75% sulphur and 5% DDT + 75% sulphur were applied by aeroplane to tomatoes during August–October, and all gave effective control of corn earworm [*Heliothis armigera*]. Tomato leafminers were satisfactorily controlled by aerial applications of diazinon, Korlan or parathion.

4689. VESSIA, R.
Gli insetti dannosi alle coltivazioni del pomodoro in Campania. **(The insect pests of tomato crops in Campania.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 388-408, bibl. 15, illus.

Various moths (individually described) and the green bug (*Nezara viridula*) are controlled by soil treatment with aldrin and by spraying after topping with DDT or aldrin at 0·2%, or lindane or chlordane at 0·15%, or a mixture of 200 g. of DDT, 50 g. of parathion and 30 g. of sticker per 100 l. of water. The DDT and the mixture are used every 20 days and the other products every 15 days. No treatment should be given within 20–30 days of harvesting, because of residue risks.

4690. SMIRNOV, N. A.
The control of whitefly. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, 5(4): 43-5, illus.

In the central part of the European U.S.S.R. the whitefly [*Bemisia tabaci*] causes severe damage to tomatoes, cucumbers and melons in glasshouses. The most intensive breeding occurs in April and May. All control measures have hitherto proved inadequate. When the rows were smoked individually with bee smokers, using nicotine sulphate in tobacco dust at 1 : 12, and the adults, which detached themselves and fell from the leaves, were collected in containers of water, the adult population was considerably reduced. As this method is not effective against the eggs, the smoking should be repeated every 12–15 days during emergence. For control of the adults and several other injurious insects NIUIF-100 emulsion at 0·03–0·05% gave good control.

4691. BRAITHWAITE, B. M., AND BLAKE, C. D.
Low gallonage application for pest and disease control in tomatoes.
J. Aust. Inst. agric. Sci., 1960, **26**: 358-60, bibl. 1.

A concentrate oil programme, applying copper oxychloride and DDT with 2 pints of unemulsified mineral oil, was compared with a semi-concentrate water programme in which the same chemicals were mixed with 2 gal. water, and with controls. Yields of the variety Rouge de Marmande with the semi-concentrate programme were 46% higher than with the concentrate programme and 125% higher than with the controls. The concentrate programme gave inadequate leaf coverage and poor disease control, caused scorching of stems and leaves, and possibly reduced plant vigour and fruit set compared with the semi-concentrate programme. Semi-concentrate spraying controlled the *Heliothis punctigera* caterpillar, septoria leaf-spot (*S. lycopersici*) and early blight (*Alternaria solani*). The success of the semi-concentrate programme of fungicide and insecticide application will allow the use of lightweight portable misting apparatus.—Dep. Agric., Murwillumbah, N.S.W.

Tomatoes—fruit quality and composition.

(*See also* 3727, 4642.)

4692. BONTOVITS, L.
Konzervipari paradicsom minőségének néhány kérdése. **(Some problems of quality in canning tomatoes.)** [English and Russian summaries 1 p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(4): 85-95, bibl. 18.

In general, the colour of staked tomatoes was better than that of unstaked ones, but in hot, dry weather the opposite was the case. Varieties reacted differently to certain climatic factors, and those showing the highest biological values were the most sensitive to these factors. For determining the colour of both tomatoes and purée the international colour system was the most suitable. In purées, in addition to colour, consistency and pectin content were the main factors affecting quality.

4693. GARRETT, A. W., AND OTHERS.
Evaluation of instruments to measure firmness of tomatoes.
Food Technol., 1960, **14**: 562-4, bibl. 10, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-144.

A highly significant correlation was found between the firmness values obtained using either the Asco Firmness meter or the Firmometer; both instruments can be used in the breeding programme as well as in the quality control of fresh tomatoes. The McCollum Firmness meter is useful as a tool in the selection of firm fleshed tomato varieties.

4694. TAKAHASHI, T., NAKAYAMA, M., AND ARIMA, H.
Studies on the colouring of tomato fruits. IV. Changes of pigment contents in bagged fruits. [Japanese, with English summary ¾p.]
J. hort. Ass. Japan, 1960, **29**: 203-11, bibl. 7, illus.

Tomato plants were grown with the fruits covered with red, green, blue, black or transparent plastic bags and subsequently the fruits were stored in rooms at 10° C. or 20° C. under artificial light and in a glasshouse with additional artificial light at night. Fruit stored at 20° C. developed the most pigment, but the bag colour had no effect on the pigments developed during subsequent storage. Fruit in transparent bags matured quicker on the plant than that in black bags, and fruit in white bags had the highest contents of chlorophyll, carotene, lycopene and xanthophyll. Light intensity equivalent to 30% of natural light is considered to be sufficient for pigment formation. All bagged fruits were smaller than the controls. Control fruits had higher % dry weights and pH values than bagged fruits, but fruits enclosed in white bags had the highest sugar content. [For part III, see *H.A.*, 30: 3950.]

Sundry crops.

(*See also* 3658, 4444.)

4695. YU KING KEY.
A trial culture of the Chinese water chestnut (*Eleocharis dulcis*) at the Araneta University experimental ground.
Araneta J. Agric., 1960, **7**: 116-28, bibl. 5, illus.

With data on germination of "seed" tubers, plant growth and yield and size of tubers.

4696. MAHAJAN, M. K.
Twin fruits of *Hibiscus esculentus* Linn.
Sci. and Cult., 1960, **26**: 283-4, bibl. 5, illus.

TOBACCO.

General.

(*See also* 5557, 5575, 5576, 5578, 5584.)

4697. Baker, A. E.
Tobacco production in Western Australia.
J. Agric. W. Aust., 1960, **1**: 961-70, illus.

Seed-bed preparation, transplanting, fertilizers, harvesting, curing, grading and marketing.

4698. Anon.
La culture du tabac au Congo ex-belge. (**Tobacco culture in the former Belgian Congo.**)
Rapp. annu. Stat. Essais Kaniama, reprinted in *Rev. int. Tabacs*, 1960, **35**: 222-3, 235.

Variety trials to select a fire-cured cultivar with a regular yield suitable for cigarettes are reported. Nyassa gave the highest yield. The mineral composition of tobaccos was compared, and fertilizer trials showed that an application of mineral fertilizer with a N/P ratio of about 0·4 plus farmyard manure was beneficial. A spacing of 1·10 × 0·60 m. or 13,880 plants/ha. is recommended. An irrigation trial on White Burley tobacco grown in a red soil during the dry season showed that during the first month of growth the daily application should be limited to 2·5–3·0 mm.

4699. Murty, G. S.
Tobacco research in India.
Indian Tobacco, 1960, **10**: 211-31, illus.

The organization of the Central Tobacco Research Institute at Rajahmundry and several subsidiary stations is outlined. Current programmes at these stations are reviewed, and the lines along which future research will be directed are indicated.

4700. Chitedze Agricultural Research Station.
Dark tobacco.
Nyasaland Fmr For., 1961, **5**(3): 21-2.

Increased yields were again obtained by the application of 200 lb./acre of ammonium sulphate, and further increases with the simultaneous application of 200 lb./acre of single superphosphate. In burley variety trials Barnet Special was the heaviest cropper, giving 242 lb./acre more than Stand Upright.

4701. U.S. Dep. Agric., Agricultural Marketing Service.
Annual report on tobacco statistics, 1959.
Statist. Bull. U.S. Dep. Agric. **260**, 1960, pp. 75.

Production and trade, mainly U.S.

4702. Clark, F., and Brothers, S. L.
Progress of the flue-cured tobacco (type 14) industry in Florida, 1939-1959.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 276-87, bibl. 18.

Areas, yields, methods and pest and disease control.

4703. Festenstein, G. N.
Extraction of proteins from green leaves.
J. Sci. Food Agric., 1961, **12**: 305-12, bibl. 27.

Maceration in a steel press and subsequent extraction, including the use of detergents, resulted in 90 to 95% extraction of nitrogenous material from young tobacco leaves. Beans (*Phaseolus vulgaris*) gave a slightly lower extraction figure.—Rothamsted exp. Stat., Harpenden, Herts.

Breeding and varieties.

(*See also* 4783, 4789.)

4704. Gerstel, D. U.
Essay on the origin of tobacco.
Tobacco, N.Y., 1961, **152**(5): 19-22, bibl. 17.

The problem is discussed of the dominant gene for an enzyme which demethylates nicotine when the leaves mature and which is found in the wild ancestral species from which tobacco probably originated. This gene would presumably have occurred in tobacco also when it first appeared and would have rendered it less attractive to man unless consumed green.—N.C. St. Coll., Raleigh.

4705. Kosmodem'janskij, V. N.
Results of the work of VITIM [All-Union Scientific Research Institute for Tobacco and Mahorka] in tobacco selection. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 5-22.

Tobacco selection since 1914 is reviewed and work done between 1945 and 1958 considered in some detail. The variety and species collection of the Institute comprises over 7,600 specimens from more than 50 countries and is used for the breeding, selection and improvement of specific types of tobacco. In addition to developing varieties resistant to single and complex diseases, some important results were obtained with large-leaved varieties that had low labour requirements and produced high yields. The general trend is the replacement of small-leaved tobaccos by medium- and large-leaved varieties. A list is attached of 49 varieties released by the Institute or its stations since 1930, 17 of which have, however, been subsequently withdrawn.

4706. Dean, C. E.
Tobacco breeding in Florida during the past twenty years.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 132-8, bibl. 19.

Flue-cured and cigar-wrapper tobaccos are considered separately. Emphasis has been on the development of varieties with multiple disease resistance.

4707. McMurtrey, J. E., Jr., Wilson, D. B., and Pointer, J. P.
Natural crossing of tobacco under Maryland conditions.
Tobacco, N.Y., 1960, **151**(27): 51-6, bibl. 6, illus.

Systematic tests in 1956, 1957 and 1958 with varieties planted adjacent to one another and at distances ranging from $\frac{1}{20}$ to $\frac{1}{2}$ mile showed that natural crossing occurred between adjacent plots of normal flowering varieties to the extent of 2–11% and in a male strain adjacent to a normal flowering variety to the extent of 7–28%. There was also an increase in crossing in plants dusted with insecticide. The percentage of crossing decreased with distance, but crossing still occurred occasionally in plots isolated by half a mile.—U.S.D.A., Beltsville, Md.

4708. Ligeti, L.
Dohányvetőmag termesztése Magyarországon. **(Tobacco seed production in Hungary.)**
Dohányipar, 1957, Dec., pp. 1-6, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 224.

Methods of maintaining varieties and improvement through breeding.

4709. Endemann, W.
Ein Beitrag zur Vererbung des Zuckergehaltes im Tabakblatt. **(A contribution on the heredity of the sugar content in tobacco leaves.)** [Russian and English summaries $\frac{1}{3}$ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 178-86, bibl. 2.

4710. Stines, W. J., and Mann, T. J.
Diploidization in *Nicotiana tabacum*.
J. Hered., 1960, **51**: 222-7, bibl. 13, illus.

Studies on the inheritance of the chlorophyll-deficient yellow burley character.

4711. Ternovskij, M. F., and Terent'eva, A. I.
Preliminary vegetative rapprochement in the interspecific hybridization of tobacco and mahorka. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 23-8, bibl. 10.

For another account of this work on the role of grafting in improving the crossing potential of *Nicotiana* species, see *H.A.*, 31: 855.

4712. Burcev, Ju. A.
Investigation of tobacco varieties with few side shoots. [Russian.]
Agrobiologija, 1960, No. 3, pp. 345-9, illus.

Generations of hybrids have been tested which produce up to 20 leaves on the main stem without the formation of suckers. Some of these were tested in several localities for 3–4 years and were found to give higher yields of leaf with higher nicotine contents than the standard variety Hmelovka.

4713. Holmes, F. O.
Concomitant inheritance of resistance to several viral diseases in tobacco.
Virology, 1961, **13**: 409-13, bibl. 4, illus.

A line selected from the parental line T.I. 245 as having resistance to mosaic was found to show resistance to 6 other virus diseases, thus suggesting that all these forms of resistance depend on the same genetic mechanism.—Rockefeller Inst., N.Y.

4714. Clark, F.
Flue-cured tobacco improvement.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 49-50.

Eight tobacco lines showed high resistance to nematodes and produced good yields with fair to good quality. N.C.73 and S.C.58, released by their respective states, show some black shank resistance.

4715. Moore, E. L., Powell, N. T., and Gwynn, G. R.
Search for root-knot and black-shank resistance.
Res. and Fmg, N.C., 1960, **18**(3): 3, illus.

Lines 8069-3 and 8069-5 of the Hicks Broadleaf family and line 8038-3 of the 5346 family combine high resistance to root-knot and black shank with some resistance to *Fusarium* wilt and Granville wilt. They also show considerable tolerance to brown spot.

4716. Anon.
Root knot doesn't affect NC 95.
Agric. Res., Wash., 1961, **9**(8): 15.

NC 95 is resistant to the root-knot nematode and produces high yields equal to those of NC 75 and Coker 316 and 10% higher than that of Hicks Broadleaf; it also equals NC 75 and Coker 316 in flavour. The transplants are slow-growing initially, but they develop rapidly and flower about a week later than Hicks.—N.C. agric. Exp. Stat.

4717. Gruševoj, S. E., Psareva, E. N., and Matveenko, T. M.
The susceptibility of different tobacco varieties to black root rot and the selection of resistant strains. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 52-64, bibl. 12.

Visual observations on growth followed by microscopical examinations of tobacco seedlings grown in inoculated soil are considered a suitable method of testing varieties for susceptibility to *Thielaviopsis basicola*. By this method some resistant lines of the Samsun varieties were selected. Of 51 foreign varieties tested 9 were found resistant and 8 slightly susceptible [see also *H.A.*, 30: 5647].

4718. Povilaitis, B.
Performance of flue-cured tobacco varieties in 1959.
Lighter, 1960, **30**(4): 25-9, bibl. 5.

In trials in Ontario yields of cured leaf ranged from 1,678 to 2,007 lb. per acre, the highest yields being given by C-54, Coker 139 and E-57 and the lowest by Delcrest, Jadel and Hicks. The highest grade index was reached by P-38, Delcrest and E-56, the lowest by C-54, Virginia 21 and E-57. The breeding lines matured more slowly than the commercial types with the exception of Coker 139, which also showed an abnormal total alkaloids to total N ratio. Significant varietal differences were found in total sugar content and in all physical tests except burn tests. Filling value was highest for Coker 139 and Virginia 21 and lowest for C-54, E-58 and White Gold. The brightest tobacco was obtained from Coker 139 and E-57, the darkest from Jadel, C-54 and White Gold. Hicks, Jadel, E-56 and P-38 produced the largest amount of sucker growth per acre and Coker 139, Virginia 21, P-46 and C-54 the smallest amount.

4719. Sand, S. A.
The pedigree of Connecticut 49 shade tobacco.
Bull. Conn. agric. Exp. Stat. **630**, 1960, pp. 12, bibl. 6, illus.

A historical account of work over 40 years leading to the development of Connecticut 49, now the most widely grown cigar wrapper variety in Connecticut.

4720. Bolsunov, I.
Semperante, une variété "Superburley", récemment introduite dans la culture de tabac autrichienne. (**Semperante, a "super-burley" variety recently introduced into Austrian tobacco growing.**)
Rev. int. Tabacs, 1960, **35**: 162.

Seeds and seed-beds.

(*See also* 4708, 4731, 4732.)

4721. Čirkovskij, V. I.
Concerning the output of tobacco and mahorka seeds in regions not producing stable seed yields of these crops. [Russian.]
Agrobiologija, 1960, No. 4, pp. 539-41.

If inflorescences were harvested when the pods were starting to turn brown often only 1 pod produced seeds suitable for sowing. Delaying harvesting until 20% of the pods were brown resulted in a considerable increase in the yield of standard quality seeds. The removal of 15–20% of the flowers and pods from the periphery of the inflorescence 10–15 days before harvest resulted in an even higher percentage of good quality seeds, up to 40% in unfavourable years in Western Siberia. Browning pods should be harvested before autumn frosts cause them to fall to the ground.

4722. Čirkovskij, V. I.
The effect of ecological factors during the formation of tobacco seeds on the ageing process of the seeds. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 65-76, bibl. 5, illus.

In tobacco seeds stored for 2½ years at 30° C. a relative humidity of 60% induced more rapid ageing than 10% R.H. [see also *H.A.*, 30: 2394]. A storage temperature of 12° C. retarded ageing. Under unfavourable conditions the ageing process became intensified after 1½ years, and one additional year's storage resulted in the death of most of the seeds. Seeds from plants grown in an arid climate showed a less advanced stage of physiological maturity, and aged more rapidly, than those grown under more humid conditions. Where seeds were taken from plants grown in similar environments, apart from differences in humidity, the higher the R.H. was during ripening, the more rapid was the subsequent ageing of the seeds. In this case the rate of ageing of the seeds was directly related to the stage of development reached on the plant and corresponded to their physiological maturity.

4723. Čirkovskij, V. I.
The importance of ecological factors in the photosensitivity of tobacco seeds during germination. [Russian.]
Vestn. sel'sk. Nauki, 1960, **5**(5): 124-5.

Seeds from plants grown in two regions were stored at temperatures of 6–19° C. or 30° C. and at relative humidities of 60% or 10%. Germination was better after storage at the lower temperature and the higher R.H. [See also *H.A.*, 31: 2394.] Germination was always better in the light than in the dark, but darkness was less inhibitory to seeds from one region than to seeds from the other region.

4724. Franco, C. M., and Bacchi, O.
Estudos sôbre a conservação de sementes. VII. Fumo. (**Seed storage studies. VII. Tobacco.**) [English summary 9 lines.]
Bragantia, 1960, **19**: cv-cvii, bibl. 2.

Investigations showed that the best R.H. for the storage of Tietê tobacco seeds is 10%. At this R.H. seeds still showed more than 75% viability after 15 years' storage. Control seeds stored under laboratory conditions maintained 75% viability for up to 21 months.

4725. Jakovuk, A. S.
Conditions of germination and the cold resistance of tobacco seeds. [Russian.]
Tabak, 1961, **22**(1): 45-6.

Results are given of several experiments on the effects of pre-germination treatments and of methods of germination on the cold resistance of tobacco. From these it is concluded that tobacco seeds and seedlings are fairly resistant to temperatures of −1 to −3° C., but that resistance is affected by variety and physiological conditions.

4726. Zvjagina, E. A.
Gibberellin, a stimulant of tobacco seed germination. [Russian.]
Vestn. sel'sk. Nauki, 1961, 6(1): 36.

The germination of freshly harvested seeds from 7 species of *Nicotiana* and from a *Nicotiana* × tobacco hybrid was greatly improved by placing them in Petri dishes on filter paper moistened with 0·02% GA. [See also *H.A.*, 31: 884.]

4727. de Castro, S. P.
A comparative study of efficiency of the different seedbed covers for tobacco.
Araneta J. Agric., 1960, **7**: 129-49, bibl. 10, illus.

Polythene sheet, nipa shingles [palm leaves?], *coco-crudo* [cloth?] and cut talahib grass were compared. The seedlings under polythene were healthy and grew most rapidly, the seedling stage being shortened by 5 days to a total of 40 days from sowing. The nipa cover also gave good results.

4728. Mitskovski, J., and Roza, M.
Examination of the effects of some chemicals for disinfection of the soil in tobacco seedbeds. [Serbo-Croatian, with English summary.]
Duvan, 1960, **10**: 175-95, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1855.

The fungicidal and herbicidal efficiencies were tested of Vapam, Vapam + allyl alcohol, Mylone, Bedrench and DD + allyl alcohol applied 20 days before sowing tobacco. All treatments were equally effective. Combination treatments are not considered necessary. [See also *H.A.*, 30: 5299.]

4729. Cibes Viade, H. R.
How weeds are controlled in leaf tobacco seedbeds.
Tobacco, N.Y., 1960, **151**(27): 18.

Allyl alcohol, allyl alcohol plus ethylene dibromide or allyl alcohol plus DD recommended for conditions in Puerto Rico.

4730. Miyazaki, T., Tokitsu, T., and Muraoka, Y.
Effects of hardening by water control on characters of tobacco seedlings and subsequent growth after transplanting. [Japanese, with English summary.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 17, pp. 11-21, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1628.

Tobacco seedlings in the second nursery stage were hardened by reducing the water supply to different extents. Hardened seedlings made good root growth at low temperatures and were drought resistant, but the expected effects of hardening on carbohydrate accumulation were not observed. To be effective hardening needed to be carried out over a long period starting at the beginning of the second nursery stage.

Planting and cultivation.

(*See also* 3742, 4739, 4756.)

4731. Smith, E. M.
Mechanizing tobacco production.
Ky Fm Home Sci., 1959, **5**(3): 4-6, illus.

Mechanized direct field sowing of burley (Ky. 58) seeds uniformly coated with clay resulted in successful germination. A black polythene mulch was placed over the row just before sowing to control weeds, conserve moisture, and increase soil temperature. The seeds were sown through holes cut in the plastic sheet. In trials involving 5 different methods of harvesting tobacco the use of both priming and stalk cutting machines resulted in higher gross returns per 100 lb. of cured leaf than were obtained with hand cutting.

4732. (Smith, E. M.)
Tobacco planter, harvester under construction.
Ky Fm Home Sci., 1960, **6**(4): 7-8, illus.

A machine being developed for direct sowing in the field of clay-pelleted tobacco seeds below a plastic mulch is briefly described, together with a harvesting machine which 1 man can operate to harvest 3 acres of tobacco daily. With this harvester the cut stalks are forced onto sticks as they are harvested, and these are then conveyed to a wagon for transport to the barn.

4733. Pellizzi, G.
Il trapianto meccanico del tabacco: prime indagini sperimentali. (**The mechanical transplanting of tobacco: preliminary experimental studies.**)
Ann. Fac. Agr. Milano, 1958 (issued 1959), **7**: 71-87, bibl. 4, illus.

The 3 types of tobacco planting machine available for use in Italy are described. All 3 are tractor-drawn and have water tanks for irrigation during planting. One also includes a device for fertilizer placement. Of the various models of these 3 types those planting more than 2 rows at a time proved too cumbersome.

4734. Šamaev, G. P.
New machines for planting tobacco and mahorka seedlings. [Russian.]
Dobyšev, A. M., Stebljanko, F. I., and Černjak, A. A.
The seedling planting machine SKNB-4. [Russian.]
Tabak, 1961, **22**(1): 27-32, illus., and 33-4, illus.

In the first article 3 out of several tobacco planting machines mentioned are recommended and described, and in the second paper a further account is given of one of them.

4735. Nor, M. I.
A universal square-group planting machine. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 109-16, illus.

The tractor-drawn planting machine SU6-VITIM served by 13–16 workers is able to plant and water tobacco, tomato and cabbage plants in the row, on the square and in groups on the square, either on unmarked or marked out land. In terms of man hours planting by machine was 4 times faster than by hand.

4736. Muraoka, Y., and Tokitsu, T.
Effects of the time of transplanting on yield and quality of tobacco leaves. [Japanese, with English summary.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 17, pp. 2-10, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1630.

Time of transplanting hardly affected the number and size of leaves but early transplanting increased the weight/unit area ratio. Late transplanted tobacco showed a remarkable decrease in crop weight, severe attacks of CMV disease and poor leaf quality after flue-curing. In 3 other areas, however, yield differences were not so marked. The most suitable time for transplanting was when the mean air temperature reached 12–13° C.; adverse effects on yield and quality appeared when transplanting was done after the mean air temperature had reached 14–15° C.

4737. Weidemann, C.
Tabakanbaumethoden im Blickpunkt der Mechanisierung und des Arbeitsaufwandes. **(Methods of tobacco cultivation with reference to mechanization and the utilization of labour.)** [English and Russian summaries ½ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 141-77, bibl. 15, illus.

Changing the spacing of Wohlsdorfer, Burley and Ergo from 50 × 50 cm. to 62·5 × 40 cm. permitted the use of planting machines without seriously reducing yield. In comparison with manual methods the rate of planting was increased 5-fold. Stringing rate was also increased by 70% or more by the use of machines. Reduction of the stand density from 40,000 to 27,800 plants per ha. reduced man-hours by 26%, while the yield was only reduced by 9·5%.

4738. Kawakami, Y., and Kashihara, Y.
Studies on the toxicity of herbicides on tobacco. Parts 1-13. [Japanese, with English summaries.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 19, pp. 1-90, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1627.

Studies on the following herbicides are reported in some detail: 2,4-D (including the *Raphanus* hypocotyl test), MCP, SES, CMU, CAT, IPC, sodium chlorate, PCP, ATA, Desiccant No. 1, Premerge and Dowpon. In each case critical concentrations are given and toxicity symptoms are described.

Climate and irrigation.

(*See also* 4748.)

4739. Tomić, L., and Janković, Ž.
Uticaj vremena rasadjivanja i nekih klimatskih činilaca na sitnolisnost orijentalnih duvana. **(The effect of transplanting time and certain climatic factors on the size of oriental tobacco leaves.)** [French summary 1 p.]
Arh. poljopr. Nauke, 1960, **13**(40): 37-53, bibl. 3.

The small leaf size required for high quality in the oriental variety JK7-4/2 was best attained by transplanting between 5 May and 5 June, and limiting the yield to 1,200 kg./ha. To produce small leaves and good yields the average temperature must be above 21° C. and rainfall very low.—Tob. Inst., Belgrade.

4740. Tokitsu, T., and Tsukamura, T.
Effects of shading on growth and constitutional factors of yield and quality in tobacco. I. Effects of shading during the whole growing season. II. Effects of shading at different growth stages. III. Effects of shading at the growth stage before topping.
Tokitsu, T., and Ohori, K.
Idem. IV. Effects of shading and watering before priming on the change of leaf colour. [Japanese, with English summaries.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 17, pp. 22-32, 33-42, 43-8, 49-53, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1635.

Part I. Tobacco was grown under shades composed of various thicknesses of lawn and also under a reed screen. The latter retarded growth conspicuously. In the open the light intensity was 50,000–80,000 lux and 25,000–50,000 lux on cloudy days. Under a single lawn cover it was 35,000–50,000 lux and under a treble cover 18,000–28,000 lux. Increased shading reduced the leaf weight/unit area ratio and quality, and it is presumed that yield and quality would be lowered in continuous cloudy weather. A single lawn sheet had little effect on Bright Yellow, but Delcrest was more sensitive. *Part II.* Shading from flower bud initiation to topping caused the leaves to be narrow, smaller and lighter. Shading at the end of the maturing stage improved leaf colour and increased the N content, but quality and carbohydrates were reduced. Shading from transplanting to flower bud initiation or for 30 days after topping had little effect on yield or quality. *Part III.* Yield reduction due to reduced leaf size and weight occurred at light intensities below 50% of normal, and it is recommended that topping should be done by the beginning of the rainy season, planting being timed accordingly. *Part IV.* Watering improved leaf colour and N content in mature plants after topping but reduced carbohydrates. MH had no effect on leaf colour.

4741. Maškovcev, M. F.
The effect of soil moisture on nicotine accumulation in tobacco plants. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 83-9.

In tobacco plants grown in pots in which the soil was maintained at 40, 60 and 80% of field capacity, the increased growth induced by the higher moisture level was more evident in the shoots than in the roots. Initially, root growth was more rapid at 40% than at 80%, and, although this was reversed at a later stage, the root : shoot ratio remained higher at the low moisture level. During the first 23 days of growth the rate of nicotine accumulation per plant was essentially uniform, irrespective of soil moisture, which resulted in a lower nicotine percentage in the high moisture plants. During the next 14 days an increase in the rate of nicotine accumulation by the low moisture plants increased the absolute values also above those of the high moisture plants. It is concluded that, while there is a relationship between the rate of nicotine production in the roots and external conditions, this is independent of the rate of root growth. The synthesis of nicotine compounds in the roots would appear to be unstable and to be readily affected by environment, in particular soil moisture. [For work on the effect of N nutrition, see *H.A.*, 30: 827.]

4742. Jones, J. N., Jr., and others.
Principles of tobacco irrigation.
Agric. Inf. Bull. U.S. Dep. Agric. **228**, 1960, pp. 16, illus., from *Trop. Abstr.*, 1961, **16**, Abstr. i425.

The general principles of irrigating tobacco are reviewed. A water supply of at least 9 acre-in. should be available for each acre irrigated, and irrigation should be started when soil moisture falls to 50% of the available water-holding capacity.

4743. Chandnani, J. J., Gandhi, R. T., and Singh, K.
Preliminary studies on the comparative value of flood, furrow and sprinkler systems of irrigation.
Indian J. Agron., 1960, **4**: 222-9, bibl. 8.

The rustica tobacco variety N.P.219 was grown under sprinkler and furrow systems in 1955–56 and in a split plot design combining all 3 types of irrigation and several levels of N fertilization in 1956–57. Furrow irrigation gave the highest yield but flood irrigation produced nearly the same gross income. Sprinkler irrigation gave a poor return on tobacco grown for seed and a net loss on tobacco grown for leaf. The manurial treatment results are not discussed.—Indian agric. Res. Inst., New Delhi.

Soils, nutrition and mineral composition.

(*See also* 4397, 4762, 5568.)

4744. Sastry, A. S., and Sastry, T. G.
Preliminary studies on the deterioration of colour in Indian flue-cured Virginia tobacco.
Indian Tobacco, 1960, **10**: 253-61, bibl. 17.

Leaf samples of Harrison Special were picked from 10 sites representing 5 soil types (saline, low-lying, tank-bed, inundated and high-level soils), and the effects on their colour produced by storing in the laboratory at (a) 30° C. and 89% R.H., (b) 30° C. and 71·2% R.H. and (c) 30° C. *in vacuo* were investigated. Thinner leaves were found to deteriorate in colour more rapidly than thicker leaves, and the brighter leaves than the less bright. The high-level soils gave thicker leaves than the other 4 types. Deterioration was most rapid under the higher humidity and slowest *in vacuo*, suggesting that it was due to the oxidation of polyphenols, in which both moisture and oxygen played an important part.—Cent. Tob. Res. Stat., Rajahmundry.

4745. Jakovuk, A. S.
The effect of micro-ecological conditions under which tobacco seeds were produced in the Crimea on variations in the aroma of the raw material. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 77-82.

Experiments with 2 varieties of aromatic tobacco raised from seeds taken from plants on 2 major soil types in the Crimea have shown that aroma is a varietal characteristic that is inherited even under growing conditions unfavourable for its development. Under unfavourable conditions it remains latent or is only faintly developed.

4746. Pearse, H. L.
Growth conditions and the characteristics of cured tobacco leaves. II. The influence of modified nutrition at different growth stages on the composition of plants and leaves. [Afrikaans and French summaries ½ p. each.]
S. Afr. J. agric. Sci., 1960, **3**: 603-11, bibl. 8.

Tobacco plants of a variety suitable for flue-curing were grown in nutrient culture in a glasshouse, and feeding was stopped at different physiological stages of growth. After feeding was stopped at an early stage of growth (18 in.), the cured leaves had high sugar, low N and low nicotine contents.

When feeding was continued to a later physiological stage, the sugar content was reduced, and the N and nicotine contents were increased, in the cured leaves. When feeding was maintained at a high level up to 1 week after topping, the nicotine content of the top leaves reached a very high level despite the fact that the N content was not high enough to produce undesirable leaf colours during flue-curing. The amount of nicotine per unit of N produced in the leaves increased as feeding was continued to a later stage of growth. [For Part I, see *H.A.*, 31: 2689.]—Cent. Tob. Res. Inst., Rustenburg.

4747. WALLACE, R. W.
Fertilizer experiment with shade tobacco.
A.R. Fla agric. Exp. Stats, 1958-59, p. 328.

Results for a 5-year period with shade tobacco indicate that yield is influenced more by N than by either P_2O_5 or K_2O. As rates of N were increased from 100 to 300 lb. per acre, yield increased but fire-holding capacity decreased. Yield, grade index, crop index and fire-holding capacity were influenced only slightly by P_2O_5 at 50 to 200 lb. or by K_2O at 100 to 300 lb. The basic treatment of 200 lb. of N, 125 lb. of P_2O_5 and 200 lb. of K_2O was as good as higher rates.

4748. HAUSER, J.
Milyen befolyást gyakorol a talaj nedvesség és nitrogéntartalma a dohány növekedésére, a levelek összetételére és minőségére.
(On the influence of soil moisture and nitrogen content on tobacco growth, leaf composition and quality.)
Dohányipar, Jan. 1958, pp. 6-12, from *Hung. agric. Rev.*, 1958, 7, Abstr. 226.

Virginia Gold responded more readily to an increase in soil moisture than the variety H 2/c, the effects being a reduction in the N, K and nicotine contents and an increase in the Ca content and quality. Raising the N dosage reduced the uptake of K, Ca and P, but increased the nicotine content. Nitrogen uptake was scarcely affected by soil moisture conditions, but water consumption was closely correlated with them.

4749. PRITCHETT, W. L., BRELAND, H. L., AND LUNDY, H. W.
Effect of nitrogen fertilizer on the yield and composition of flue-cured tobacco.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 418-27, bibl. 6.

Organic matter had little effect, but mineral N side-dressings increased yields at all levels and raised the K and Ca contents in the leaves. The N and nicotine contents of the leaves were increased by 0·09 and 0·07%, respectively, for each 15 lb. of N added per acre.—Fla agric. Exp. Stats.

4750. YOSHIDA, D.
Effect of nitrogen nutrition on the free amino acid composition in tobacco plant.
Soil and Plant Food, 1961, **6**: 99-102, bibl. 2.

Tobacco plants were grown at 2 levels of urea, viz. 0·75 kg. and 2·25 kg. N per acre. At the higher level flue-cured leaves had higher contents of glutamic acid, aspartic acid, serine, glycine, valine, phenylalanine, α-alanine and proline and lower contents of hydroxyproline and γ-aminobutyric acid. [See also *H.A.*, 31: 2693.]—Hatano Tob. Exp. Stat.

4751. ANANTH, K. C.
Nicotine content and smoking qualities of cheroot, hookah and chewing types of tobacco as influenced by increasing levels of nitrogen.
Allahabad Fmr, 1959, **33**: 420-32, from *Tob. Abstr.*, 1960, **4**, Abstr. 1783.

Nicotine content increased under high levels of N fertilization but showed a decline at the time of floral initiation. Nicotine contents were lower in varieties with good aerial growth. There was no significant correlation between the nicotine content and yield, but the nicotine content was negatively correlated with burning capacity. Heavy N fertilization improved burning and smoking quality, particularly in the variety Vellaivazhai which was best in this respect. The variety I.P.58 showed the poorest quality, but had the highest nicotine content in all parts except the roots.

4752. IVANOVSKIJ, N. P.
New phosphorus fertilizers for tobacco and mahorka.
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 90-108, bibl. 12.

Phosphatic fertilizers were tested at 7 experimental stations or fields over several seasons. Thermophosphate and fused magnesium phosphate were not inferior to superphosphate in their effect on tobacco and mahorka yields and quality and can be recommended. Magnesium ammonium phosphate was equal to superphosphate in its effect on yield and grade, but in some cases impaired chemical composition and burn. A mixture of magnesium ammonium sulphate and superphosphate was not inferior to the latter applied alone and is recommended at 1 : 1. In a 1-year trial basic slag and defluorinated phosphate gave yields equalling those from superphosphate.

4753. BRELAND, H. L., PRITCHETT, W. L., AND LUNDY, H. W.
Effects of liming on yield and value of flue-cured tobacco in the Suwannee Valley area.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 409-18, bibl. 11.

The application of 1 ton per acre of a high-calcium limestone increased yields by 161 lb., while 2 tons of dolomitic limestone raised the yield by 391 lb. —Fla agric. Exp. Stats, Gainsville.

4754. ELLIOT, J. M., AND VICKERY, L. S.
The effect of chlorine on the hygroscopicity of flue-cured tobacco.
Canad. J. Plant Sci., 1961, **41**: 195-8, bibl. 12.

The application of 20 to 50 lb. of chlorine per acre in the form of potassium chloride had no effect on the yield or leaf-grade quality of flue-cured tobacco grown on a loamy sand. Increased applications of Cl increased the Cl content and moisture uptake, and decreased the rate of burn of the cured leaf, but had no effect on the amount of total sugars. [From authors' abstract. For earlier work, see *H.A.*, 26: 763.]—Canada Dep. Agric., Delhi, Ont.

4755. VOSS, R. C., AND NICOL, H.
Metallic trace elements in tobacco.
Reprint from *Lancet*, 1960, pp. 435-6, bibl. 3.

The ranges and mean contents of 18 metals in manufactured tobacco are given. Certain trace elements, particularly titanium, were exceptionally high, but soil contamination may be responsible.—W. Scot. agric. Coll., Auchincruive and Glasgow.

Growth, reproduction and desuckering.

4756. TOKITSU, T., AND OTHERS.
Studies on root development of tobacco. I. The conducting tissues connecting roots and leaves in tobacco. II. Effects of the height of ridges at the time of transplanting and of soil dressings on the development of roots and growth of tobacco. III. Effects of soil dressings on root and top growth of tobacco. [Japanese, with English summaries.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 17, pp. 54-68, 69-77, 78-86, illus., from *Tob. Abstr.*, 1960, 4, Abstr. 1777.

The first part concludes that the tap root mainly feeds the lower leaves and adventitious roots the upper leaves, growth in general being mainly controlled by the tap root. Too great a development of adventitious roots causes over-development of upper leaves which in turn shade the middle and lower leaves and tend to cause the tap root to decay. In part II it is stated that the growth rate after transplanting was best where ridges were high, soil dressings making little or no difference. The weight of primed leaves, quality of cured leaves and growth rate after transplanting were related. High ridging encouraged tap root development. Part III records that too frequent soil dressings on ridges of medium height sometimes had an unfavourable effect on growth or yield.

4757. KOEDŽIKOV, H., AND BOŽIDAREVIČ, A.
The effect of transplanting on the root system of mahorka. [Bulgarian, with Russian and English summaries ½ p. each.]
Nauč. Tr. visš, selskostop. Inst. G. Dimitrov, Sofia, 1960, **8**: 155-62, bibl. 6, illus.

In experiments with yellow mahorka (*Nicotiana rustica*) it was shown that transplanting modifies the morphology of the root system, reducing its weight and encouraging the development of laterals on the hypocotyl. Damaged roots have a reduced capacity for nicotine formation, and this is reflected in the nicotine content of the leaves.

4758. (NARASIMHAM, P.)
The influence of gibberellic acid in growth of tobacco plants.
Indian Tobacco, 1960, **10**: 263.

Different doses of GA were applied to the apex of tobacco shoots by the micro-drop method. Responses were noted within one week even at the lowest dosage, while after 4 weeks shoots receiving 500 μg. per plant had increased in height by about 200% compared with the controls, mainly because of longer internodes. The number of leaves produced was also increased, although their size was little affected. The higher rates also advanced flowering.—Cent. Tob. Res. Inst., Rajahmundry.

4759. SOLOV'EVA, V. M.
A study of pollination and fertilization in mahorka. [Russian.]
Tabak, 1961, **22**(1): 43-4.

In 4 botanical varieties of mahorka the stigmata were removed at intervals from 1 to 72 hours after pollination either with their own pollen or with a single or mixed foreign pollen. The removal of the stigma within 5 hours of pollination resulted in no seed being set. Complete fertilization took from 10 to 36 hours, pollen tube growth being more rapid in early than in late maturing varieties. Flowers pollinated just before opening produced the greatest number and weight of seeds per pod. When mixed pollen was used, selectivity in pollen acceptance was noted, and the percentage of different hybrids in the F_1 generation was in certain cases affected by the time elapsing between pollination and removal of the stigma. [See also *H.A.*, 30: 836.]

4760. CHANDNANI, J. J., AND THOMAS, A. I.
Preliminary studies on topping and suckering in hookah tobacco (*Nicotiana rustica*).
Indian J. Agron., 1960, **4**: 144-7, bibl. 7.

An experiment is described which showed that topping and suckering significantly increased leaf area, green weight and weight of cured leaf per plant, and also weight per unit of leaf area. In a second experiment the application of coconut oil after topping to the dormant buds in the top 6 leaf axils suppressed the development of suckers both in number and weight without affecting leaf yield. A large fountain pen with a cotton wick in place of the nib and feeder was used to apply the oil.—I.A.R.I., New Delhi.

4761. Muraoka, Y., Ōhori, K., and Miyazaki, T. **Studies on sucker control of tobacco plants. III. Effects of maleic hydrazide.** [Japanese, with English summary.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 18, pp. 8-29, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1629.

MH applied to Bright Yellow seedlings with 14–16 leaves inhibited top and root growth and increased the carbohydrate content, but when used on older plants no increase in carbohydrate content or in the quality of the cured leaves could be detected. In potted plants supplied with excess N, MH treatments did not cause much increase in carbohydrates or protein N. The most effective dose for sucker inhibition was a 0·5% solution applied to the topped plants at 20 c.c. per plant. The sodium salt was less effective than the diethanolamine salt but was sufficiently effective for practical purposes. Relatively weak plants showed some damage when given the full dosage.

4762. Birch, E. C., and Vickery, L. S.
The effect of maleic hydrazide on certain chemical constituents of flue-cured tobacco.
Canad. J. Plant Sci., 1961, **41**: 170-5, bibl. 12.

Maleic hydrazide, applied at topping time at 5 different rates ranging from 0·75 to 3·75 lb. of the actual chemical per acre, increased the total sugar and reducing sugar contents throughout the plant. The total alkaloid content in the upper part of the plant was decreased more by low rates than by high rates of MH application. The total ash, Ca, Mg, P and Cl contents were reduced in the upper part of the treated plant, whereas the K content was not affected. [Authors' abstract. See also *H.A.*, 30: 843.]—Canada Dep. Agric., Delhi, Ont.

Physiology and biochemistry.

(*See also* 3674, 3675, 3681, 3712, 3715, 4709, 4741, 4750, 4751, 4757, 4761, 4762, 4804.)

4763. Merker, J., and Pyriki, C.
Einige Faktoren, welche die Höhe des Alkaloidgehaltes von *Nicotiana tabacum* L. bestimmen. **(Several factors which determine the level of the alkaloid content of tobacco.)** [Russian and English summaries 10 lines each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 187-97, bibl. 36.

The effects of soil, N fertilization, spacing, light and temperature on alkaloid content are discussed. Tests were carried out to assess the degree of leaching of nicotine by sprays and rain, but the results obtained were conflicting.

4764. Monk, R. J.
Alkaloids and smoking quality of tobacco.
A.R. Cawthron Inst., 1959-60, 1960, pp. 34-5.

Tobacco samples, harvested and cured under similar conditions and graded for aroma and flavour, were analysed for their nicotine and nornicotine contents. The ratio of nicotine to nornicotine in 10 samples, which compared favourably with normal commercial tobacco, ranged from 4 to 19, and that of 6 tobaccos which were inferior ranged from 0·6 to 2·6. Total alkaloids for both groups were similar (2·6 and 2·8%).

4765. Lovkova, M. Ja., and Il'in, G. S.
A contribution to the synthesis of the pyrrolidine ring of nicotine. [Russian, with English summary 5 lines.]
Biohimija, 1961, **26**: 82-5, bibl. 19.

Tobacco seeds were germinated in petri dishes containing nutrient solution, to which C^{14}-labelled amino acids were added, and the quantity and radioactivity of the nicotine produced was determined 6, 8 and 10 days later. In all cases the amounts of nicotine were small after 6 days, but they increased fivefold or more after 8 days, and then almost doubled again after 10 days. Radioactivity on the 6th day was due mainly to glycine-1-C^{14} and lycine-1-C^{14}, and on the 8th day to glycine-2-C^{14}, methionine-C^{14}, arginine-C^{14} and glutamic acid-C^{14}. [For earlier work, see *H.A.*, 30: 853.]—Inst. Biochem., Moscow.

4766. Tso, T. C., Jeffrey, R. N., and Sorokin, T. P.
Biochemical studies on tobacco alkaloids. II. The relative absorption and assimilation of C^{14} from $C^{14}O_2$ gas and from $NaHC^{14}O_3$ solution.
Arch. Biochem. Biophys., 1961, **92**: 241-7, bibl. 14.

Nicotiana plants were exposed in the presence of light to various amounts of $C^{14}O_2$ for different lengths of time and under different experimental conditions. After 1 hour C^{14} activity was found in the sugars, organic acids, pigments and amino acids, in order of decreasing activity. If the exposed plant was allowed to grow a few more days in the greenhouse, C^{14} was incorporated gradually into the alkaloids. The proportion of the initial C^{14} which could be recovered from the plant extracts decreased with time after exposure. When $NaHC^{14}O_3$ was supplied to the roots of *N. rustica*, C^{14} activity was found in the pigments, amino acids, organic acids and sugars; but almost no activity was found in the alkaloids within 9 days, although eventually C^{14} activity gradually appeared in them. The total recovery of C^{14} supplied to the roots from $NaHC^{14}O_3$ was only 1·6 to 1·75%, whereas 7·5 to 13·7% of that supplied to the leaf as $C^{14}O_2$ was recovered. [From authors' abstract. For part I, see *H.A.*, 29: 2632.]—U.S.D.A., Beltsville, Md.

4767. Tso, T. C.
Biochemical studies on tobacco alkaloids. III. The incorporation of C^{14} and N^{15} in alkaloid biosynthesis.
Arch. Biochem. Biophys., 1961, **92**: 248-52, bibl. 6.

The incorporation of C^{14} and N^{15} into *Nicotiana glauca*, *N. glutinosa* and *N. rustica*, in which anabasine, nornicotine and nicotine, respectively, are the principal alkaloids, was studied. The source of C^{14} was $C^{14}O_2$ by photosynthesis or $NaHC^{14}O_3$ in solution; N^{15} was supplied in nutrient solution as $KN^{15}O_3$. C^{14} was incorporated into the alkaloids rather slowly. No activity was found in the alkaloids from plants sampled 90 minutes after the initial exposure to $C^{14}O_2$. As the plants grew C^{14} was incorporated into the alkaloids, but a gradual loss of total C^{14} from the plant took place. $NaHC^{14}O_3$ was a poorer source of C^{14} from the viewpoints of alkaloid biosynthesis and of total C^{14} recovery. The incorporation of N into alkaloids was selective. In *N. glauca* anabasine had the highest N^{15} excess, in *N. rustica* nicotine had the highest, and in *N. glutinosa* nornicotine had the highest N^{15} excess when N^{15} was supplied starting from an early stage of plant growth, whereas nicotine had the highest N^{15} excess when N^{15} was supplied only at a late stage of growth. Nicotine had the highest specific C^{14} activity of the alkaloids. [From author's abstract.]—U.S.D.A., Beltsville, Md.

4768. Tso, T. C., and Jeffrey, R. N.
Biochemical studies on tobacco alkaloids. IV. The dynamic state of nicotine supplied to *N. rustica*.
Arch. Biochem. Biophys., 1961, **92**: 253-6, bibl. 11.

Nicotine, doubly labelled with C^{14} and N^{15}, was supplied at intervals to *Nicotiana rustica* var. *brasilia* by placing the roots in a nicotine solution for 4–6 hours a day for 8 days. Of the original C^{14} activity, 34·4% was recovered and the remainder was presumably lost by respiration. The C^{14} activity of the groups of compounds recovered from the plant decreased in the following order: alkaloids, free amino acids, pigments, furfural after hydrolysis, amino acids after hydrolysis, sugars after hydrolysis, free organic acids, free sugars, insoluble residue and organic acids after hydrolysis. Of the original N^{15} excess 91·6% was recovered. The amount of N^{15} excess found in the plants was greatest in the insoluble residue after hydrolysis, followed by the amino acids after hydrolysis, free alkaloids, free amino acids and pigments. Much of the nicotine appears to have entered the plant as such and some remained unaltered. A larger proportion was metabolized, and the resulting C and N residues entered the general metabolism of the plants and appeared in all the classes of compounds separated. [From authors' abstract.]—U.S.D.A., Beltsville, Md.

4769. Kisaki, T., and Tamaki, E.
Phytochemical studies on the tobacco alkaloids. I. Optical rotatory power of nornicotine.
Arch. Biochem. Biophys., 1961, **92**: 351-5, bibl. 15.

Nornicotine derived from *l*-nicotine isolated from tobacco leaves was not optically pure [see also *H.A.*, 31: 2717].

4770. Steffens, G. L.
Chlorophyll of "chloroplasts" from Connecticut shade tobacco leaves as they mature.
Tobacco, N.Y., 1960, **151**(25): 19-23, bibl. 5.

In both field and greenhouse plants the ratio of "free" chlorophyll, i.e. that extractable with petroleum ether, to "bound" chlorophyll, only extractable with ethanol, in the leaves was measured at various growth stages and in different parts of the plant. The ratio was low until bud initiation, rising thereafter appreciably in the lower leaves and slightly in the upper leaves. In commercial crops there was a gradual and variable gradient in the ratio from leaves in different positions. Ripe leaves producing the best cigar wrapper tobacco had a ratio of about 20%, which changed only a little during wilting for a 3-day period in the curing shed.—Gen. Cigar Co., Lancaster, Pa.

4771. Swain, A. P., Rusaniwskyj, W., and Stedman, R. L.
Hexane-soluble substances of tobacco leaves.
Chem. Ind., Lond., 1961, No. 14, pp. 435-6, bibl. 10.

These are listed and described. Resins accounted for 69·4%; approximately 15% were hydrocarbons, mostly aliphatic paraffins.—U.S.D.A., Philadelphia 18, Pa.

4772. Müller, R.
Die ätherischen Öle des Tabaks. 1. Mitteilung. **(Essential oils in tobacco. 1st communication.)** [Russian and English summaries ½ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 198-215, bibl. 32.

The better grades of Oriental and Chinese Virginia tobaccos had higher essential oil contents than the lower grades, and lost larger quantities of essential oils when subjected to a continuous flow of air at room temperature. Except for high grade aromatic Oriental tobaccos, the air flow treatment tended to improve aroma.

4773. Yang, C. H., and others.
Paper chromatographic determination of rutin in tobacco.
Tobacco, N.Y., 1960, **151**(26): 21-6, bibl. 13.

To prevent it interfering with the determination of rutin by the boric-citric acid absorption method, kaempferol-3-rhamnoglucoside should be isolated by paper chromatography and removed.—Univ. Oklahoma, Norman, and Argonne nat. Lab., Ill.

4774. Bentley, H. R., and Berry, E. G. N.
The constituents of tobacco smoke: an annotated bibliography.
Res. Pap. Tobacco Mfrs' Stand. Cttee **3** (1st Suppl.), 1960, pp. 25.

The original bibliography was described briefly in *H.A.*, 29: 2643. This supplement covers the literature that appeared in 1959, together with a few earlier references not included hitherto. The supplement, which is classified and indexed rather than annotated, contains 38 references on nicotine, 7 on bases, 6 on acids, 5 on phenols, 27 on hydrocarbons, 14 on the neutral fraction and 11 on miscellaneous constituents.

Disorders, diseases and pests.

(*See also* 3761, 4713-4717, 5258, 5570.)

4775. Kosmodem'janskij, V. N., and Demčenko, T. I.
"Podgar" of tobacco and methods of measuring its intensity. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 42-51, bibl. 8.

The term "podgar" is given to a tobacco disorder characterized by the die-back or drying up from the tips or edges of mature, semi-mature and sometimes even immature leaves. The disorder itself and the premature harvesting it necessitates reduce both yield and quality. Varieties differ in their susceptibility to podgar, late maturing varieties, in general, being less prone to it. Topping was found to reduce the incidence of podgar. Of methods of measuring its intensity in leaf tobaccos the following proved the most satisfactory: The plants are left untopped but the mature leaves are picked until the appearance of the first symptoms when the plants are left intact for 2–4 weeks; the severity of the attack is then estimated by multiplying the number of affected leaves by the degree of injury and dividing by the total number of leaves. No leaves are picked from plants grown for breeding, on which podgar is assessed according to the percentage of totally or partly destroyed leaves.

4776. Aubert, O.
Les viroses du tabac en Suisse. (**Tobacco viruses in Switzerland.**)
Rev. int. Tabacs, 1960, **35**: 158.

Notes on occurrence of 5 viruses.

4777. Bald, J. G., and Solberg, R. A.
Apparent release of tobacco mosaic virus in living infected cells.
Nature, 1961, **190**: 651-2, bibl. 6, illus.

A study that may throw light on the steps in virus formation.

4778. Krylov, A. V., Smirnova, V. A., and Tarakanova, G. A.
The effect of light of different spectral composition on the multiplication of tobacco mosaic virus. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **133**: 973-5, bibl. 7, illus.

Young and mature leaves of the tobacco variety Mammoth inoculated with mosaic virus were illuminated with light from 3 types of fluorescent lamp. Light predominantly in the red end of the spectrum created conditions favourable for virus accumulation in the mature leaves, whereas when the light was mainly in the blue region virus accumulation did not take place. In leaves illuminated with ordinary daylight lamps virus accumulation proceeded normally. Young leaves showed no detectable virus under any light. It is suggested that the marked proliferation of virus diseases in glasshouse plants is due to the absorption of the ultra-violet rays by the glass, and therefore for supplementary illumination a source containing ultra-violet light should be used. [See also *H.A.*, 30: 872, and 31: 904.]

4779. Huang, T. L., and Huang, C. S.
Some preliminary studies on the treatment of tobacco stalks in farm practice and its effect on the survival of common tobacco mosaic virus in the soil. [Chinese, with English summary.]
A.R. Taiwan Tob. Wine Monop. Bur. Tob. Res. Inst. 1960, 1960, pp. 158-68, from *Tob. Abstr.*, 1960, **4**, Abstr. 1882.

Various experiments were carried out on the disposal of waste from a tobacco crop that had been artificially inoculated with TMV. The results showed that the virus can be destroyed by burning the infected stalks or by rinsing them in water. When stalks were applied directly to the field they retained their infectivity for over 3 months, but when they were composted over 90% of the virus was inactivated. Exposing the decayed or semi-decayed stalks to sunshine for 12 days resulted in a loss of over 99% infectivity.

4780. Maine, E. C.
Physiological responses in the tobacco plant to pathogenesis by *Pseudomonas solanacearum*, causal agent of bacterial wilt.
Diss. Abstr., 1960, **21**: 1016-17, being *L.C. Card No. Mic.* 60-3728 of 131 pp.

See also *H.A.*, 30: 875.

4781. Kincaid, R. R.
Progress in research on shade tobacco disease control, 1922-1959.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 270-5, bibl. 17.

Satisfactory control of black shank has been achieved by growing resistant varieties, of blue mould by zineb dustings and of root-knot nematode by soil fumigation with ethylene dibromide. Work on nematode root rot is in progress.

4782. Powell, N. T., and Nusbaum, C. J.
The black shank—root-knot complex in flue-cured tobacco.
Phytopathology, 1960, **50**: 899-906, bibl. 13, illus.

A fuller account of the work recorded in *H.A.*, 29: 612.

4783. Lea, H. W.
The quest for a blue mould resistant tobacco.
Agric. Gaz. N.S.W., 1960, **71**: 639-42, bibl. 2, illus.

The economic importance, history, spread and mode of occurrence of the disease are described, together with a method of breeding resistant hybrids using the resistant species *N. debneyi.*

4784. Cruickshank, I. A. M., and Rider, N. E.
***Peronospora tabacina* in tobacco: transpiration, growth, and related energy considerations.**
Aust. J. biol. Sci., 1961, **14**: 45-57, bibl. 20, illus.

In an investigation of the effect of *P. tabacina* infection on the transpiration and growth rates of tobacco leaves the following results were obtained: In the pre-sporulation stage the enhanced water loss from diseased plants occurred mostly at night; leaf growth was almost zero in the diseased plant from the third day after inoculation, although growth in healthy plants continued at approximately 10% per day. In the post-sporulation stage transpiration from the diseased tissue decreased. Temperature measurements at night showed that: The temperature of pre-sporulation diseased tissue was above that of healthy tissue by 0·1–0·2° C., the transport of sensible heat from the air to the leaf surface was less for diseased than for healthy tissue by an almost constant amount, and energy balance considerations adequately accounted for the measured night transpiration from healthy material but only half the requirement for the diseased tissue. [From authors' summary.]—C.S.I.R.O., Canberra.

4785. Cruickshank, I. A. M.
Germination of *Peronospora tabacina:* effect of temperature.
Aust. J. biol. Sci., 1961, **14**: 58-65, bibl. 9.

A mycological study, with a brief discussion of epidemiology under field conditions.

4786. Fischer, H.
Eine neue Tabakkrankheit. **(A new disease of tobacco.)**
Bauernblatt Schleswig-Holstein/Landpost, 1960, **14**(109): 427, from abstr. in *Z. PflKrankh.*, 1961, **68**: 47.

Blue mould appeared in Europe for the first time in 1959. Seed-beds should be sterilized with steam or formaldehyde, and after the appearance of the 3rd leaf plants should be sprayed approximately every 4 days with zineb or ferbam. Infected plants should be burnt.

4787. Kröber, H.
Untersuchung über die Blauschimmelkrankheit des Tabaks in Deutschland. I. **(Studies on blue mould disease of tobacco in Germany, I.)** [English summary 5 lines.]
Kröber, H., and Massfeller, D.
Idem. II. [English summary 11 lines.]
NachrBl. dtsch. PflSchDienst., Braunschweig, 1961, **13**: 41-4, bibl. 5, illus., and 49-54, bibl. 8, illus.

Part I. A description is given of the disease, the symptoms observed being slightly different from those described in America and Australia. *Part II.* Blue mould was completely eliminated by spraying with maneb, Polyram and Polyram-Combi at 0·05%, zineb at 0·1–0·2% and ferbam at or above 0·4%, or by dusting with maneb.—Biol. Bundesanst., Inst. Mykol., Berlin-Dahlem.

4788. Hohrjakov, M. K., Ternovskij, M. F., and Antonenko, G. P.
Tobacco blue mould. [Russian.]
Tabak, 1961, **22**(1): 38-40.

Following an outbreak of blue mould (*Peronospora tabacina*) in Europe Russian scientists were called into Czechoslovakia, where, with local specialists, they worked out prophylactic and control measures. These, together with some data from Australia and the U.S.A., are briefly outlined. In addition to the usual preventive measures, spraying with zineb, ferbam or maneb is recommended. Topped tobaccos were affected less than untopped plants, and cigar and pipe tobaccos less than the other types, but no immune or even highly resistant varieties were found.

4789. Ternovskij, M. F.
Means of developing tobacco varieties resistant to blue mould. [Russian.]
Tabak, 1961, **22**(1): 40-3, bibl. 12.

Investigations in Australia and the U.S.A. are briefly reviewed, and the use of *Nicotiana debneyi* in initial breeding work in the U.S.S.R. is outlined.

4790. Smith, J. G.
The influence of antagonistic fungi on *Thielaviopsis basicola* (Berk. et Br.) Ferraris.
Acta bot. neerl., 1960, **9**: 59-118, bibl. 101.

Certain soil fungi, after isolation, inhibited growth of *Thielaviopsis basicola.* In sterilized soil the infection of *Nicotiana glutinosa* by *T. basicola* was inhibited to some extent by the presence of *Penicillium* species. In unsterilized soil the inhibition exercised by the natural microflora was far more effective than that obtained when sterilized soil was artificially inoculated with antagonistic species. —Phytopath. Lab. "Willie Commelin Scholten", Baarn.

4791. Smith, W. A., and Saunders, G. W.
Tobacco pests in Queensland.
Qd agric. J., 1961, **87**: 100-13, illus.

Life histories and control measures of numerous pests, the major ones being looper (*Plusia argentifera*), budworm (*Heliothis armigera* and *H. punctigera*), cluster caterpillar (*Prodenia litura*), leaf miner (*Gnorimoschema operculella*), root-knot nematodes and stem borer (*G. heliopa*). [See also *H.A.*, 31: 2743.]

4792. Harrison, F. P., and Osgood, C. E.
Insecticide tests for tobacco flea beetle and green peach aphid control in Maryland tobacco.
J. econ. Ent., 1960, **53**: 963, bibl. 1.

Pre-planting soil treatment with dieldrin or heptachlor against flea beetles (*Epitrix hirtipennis*) did not provide practical results. Dimethoate, thiodan and phosphamidon applied 16 days before harvesting significantly reduced aphid (*Myzus persicae*) infestation but did not increase significantly the dollar value of the tobacco. Preplanting application of phorate granules was unsatisfactory for aphid control.—Md agric. Exp. Stat.

4793. Anon.
Controls budworms and hornworms.
Agric. Res., Wash., 1961, **9**(8): 15.

Four applications to the growing tips of tobacco plants of a bait composed of 1 part *Bacillus thuringiensis* (90 billion spores/g.) to 99 parts of cornmeal, at about 12·5 lb./acre, were as effective as endrin sprays in controlling budworms and hornworms. [See also *H.A.*, 30: 884 and 2445.]—N.C. and S.C. agric. Exp. Stats.

4794. Colina, B. H., and Fernández de Ullivarri, D.
Experimentación de diversos productos insecticidas en la lucha contra el gusano cogollero del tabaco (*Heliothis virescens* F.). **(Experiments with various insecticides on the control of the tobacco cutworm, *Heliothis virescens*.)**
Idia, 1960, No. 153, pp. 59-64, bibl. 9, illus.

The most satisfactory results were given by 50% wettable DDT at 0·25% and by a 0·2% emulsion of 15% endrin, followed in effectiveness by Sevin 50% w.p. and 40% aldrin w.p. at 0·2%.

4795. Tappan, W. B.
Effects of soil treatments with insecticides on shade-grown cigar-wrapper tobacco.
A.R. Fla agric. Exp. Stats, 1958-59, p. 331.

A broadcast application of 5% granular chlordane at 4 lb. active ingredient per acre gave very good control of mole crickets in the plant bed for 2-3 months.

4796. Tubel, B.
Recherches sur la résistance des tabacs turcs aux attaques du *Thrips tabaci* Lind. **(Research on the resistance of Turkish tobaccos to *Thrips tabaci*.)**
Rev. int. Tabacs, 1960, **35**: 205-6.

The life history of the insect, the damage caused and factors favourable or otherwise to the development of the pest are reviewed.

Harvesting, processing and quality.

(*See also* 4731, 4732, 4737, 4740, 4744-4746.)

4797. Leonov, I. P.
Aerodynamic properties of green tobacco leaves. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 151, pp. 117-26, bibl. 6, illus.

A mathematical evaluation of the physico-mechanical properties of mature tobacco leaves in relation to the use of suction during mechanical harvesting.

4798. Florencev, E. I.
The performance of spiral blades for tobacco leaf harvesting. [Russian.]
Sborn. n.-i. Rabot, VITIM, 1960, No. 15, pp. 127-35, bibl. 5, illus.

The mechanics and efficiency are discussed of an experimental tobacco leaf picker consisting of 2 parallel rotating shafts, on each of which is mounted a spiral blade made of sheet rubber. [See also *H.A.*, 30: 2449, and 31: 924.]

4799. Karabaki, A. K.
The tobacco stringing machine NT-4. [Russian.]
Tabak, 1961, **22**(1): 35-8, illus.

Powered by an 0·6 kw. electric motor, the machine consists essentially of 2 conveyor belts, one of which feeds the leaves to a needle threaded with strings 4 m. long, while the other carries away the strung leaves. With a 4-man labour force machine stringing has proved twice as fast as hand stringing.

4800. (Sloan, W. J. S.)
New tobacco curing barn.
Qd agric. J., 1960, **86**: 760.

A barn designed in New Zealand is briefly described, which employs a forced draught of hot air entering the barn at the top and passing down through the leaves to give more uniform temperatures and air movements and better quality leaves.

4801. Almy, A. S.
New trends in leaf processing point way for industry expansion.
Tobacco, N.Y., 1960, **151**(27): 11, illus.

In Puerto Rico smaller curing barns have been designed that are provided with a forced draught of sun-heated air or of artificially heated air in cool, wet weather. These can be used thrice in a season instead of twice as in the normal barn, and so reduce labour and overhead costs considerably.

4802. Muraoka, Y., Takamoto, T., and others.
Studies on the heating installation in tobacco curing. I. Open-curing system. II. Semi-open curing apparatus. [Japanese, with English summaries.]
Bull. Okayama Tob. Exp. Stat., 1959, No. 18, pp. 30-7, 38-41, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1726.

Improved curing equipment is described using smokeless fuels to provide direct heating of the barn. No adverse effects of the fumes on the cured leaf were observed, and the cost of fuel and time of curing were both less than those of ordinary flue-curing.

4803. Giovannozzi, M.
Il valore del pH come indice nella tecnologia dei tabacchi. **(The pH value as an index in tobacco technology.)**
Tabacco, 1960, **64**: 263-7, bibl. 8.

Curing and fermentation of Kentucky tobaccos were facilitated by using pH changes as control indicators.

4804. Šmatov, A. V., and Hudolej, K. D.
Reduction of the nicotine content in the mahorka raw material during factory fermentation. [Russian.]
Tabak, 1961, **22**(1): 50-1.

A 3-stage fermentation process, at 60° C. and 90–95% R.H. during the first 2 stages and at 25–30° C. and 90% R.H. during the third stage, reduced the nicotine content of mahorka, which had undergone partial natural fermentation, by 31–49%.

4805. Mathews, G. R., and Reynolds, F. B.
Preparing fire-cured tobacco for market.
Leafl. Va Polytech. Inst. **117**, 1960, pp. 2.

Notes on bulking, stripping and grading.

4806. (Barnard, C.)
Tobacco quality.
Rur. Res. C.S.I.R.O., 1960, No. 33, pp. 21-3, bibl. 1, illus.

Microscopic examinations and chemical tests were carried out on 3 collections of cured tobacco leaves to relate features of the leaf with the terms used in assessing quality, namely body, grain, lustre, elasticity and maturity. Each of these terms is defined here. [For the correlations found between anatomical and morphological characteristics and quality assessment factors, see *H.A.*, 30: 5682.]

4807. Joglar, F.
Manufacture of chewing tobacco is speciality of P.R. growers.
Tobacco, N.Y., 1960, **151**(27): 12, 21, illus.

The leaf is cured for 12–14 days without fermentation, twisted into rolls, wrapped in dry banana leaves and then allowed to ferment.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

Condiment and spice plants.

(*See also* 4816, 4859.)

4808. Hansen, H., and Bagge, H.
Forsøg med udlægsmåder for kommen 1947-1959. **(Studies on methods of growing caraway, 1947-1959.)**
Tidsskr. Planteavl, 1960, **64**: 856-65.

Yields of caraway averaged 25% more when it was sown without a nurse crop than when it was sown with barley, peas, mustard or linseed.

4809. Shimada, T.
Effects of gibberellin treatment on the photoperiodically treated fennel plant, *Foeniculum vulgare*. On the relation between flower differentiation and internode elongation of shoots in long day plants, II. [Japanese, with English summary $\frac{3}{4}$ p.]
Agric. Bull. Saga Univ., 1959, No. 9, pp. 1-78, bibl. 124 [in English], illus.

Plants that had been maintained under short days or brought to the threshold of flower initiation by 12 long days were sprayed weekly with 50 p.p.m. GA solution for 4–8 weeks under short days. The GA treatment stimulated internode elongation of the main shoots of both types of plant but failed to cause inflorescence initiation or the formation of the "deformed" leaves that are considered to be the forerunners of inflorescence initiation.

4810. Cselőtei, L.
A torma termesztéséről. **(Horse-radish cultivation.)**
Kert. Szől., 1958, **7**(3): 16-17, from *Hung. agric. Rev.*, 1958, **7**, Abstr. 231.

Horse-radish grew best on new, well-drained, basin or irrigated soils, when sown 30 cm. apart in rows 100 cm. apart. After harvesting re-growth of the horse-radish was controlled by choosing a suitable subsequent crop, such as hemp, sunflower or maize, or by applying a herbicide, such as Dicornit.

4811. Sáringer, G.
Védekezési kísérletek a mustárbogár (*Colaphellus sophiae* Schall.) ellen. **(Experiments on the control of the mustard beetle.)** [English and Russian summaries $\frac{3}{4}$ p. each.]
Növénytermelés, 1960, **9**: 335-42, bibl. 13.

The incidence of this pest can be reduced by thorough weeding in early spring, by encouraging early crop development and by trapping. DDT, toxaphene and Thiophen all gave satisfactory control of the beetle in all stages, and 2 parasites, which might provide biological control, have been observed.—Res. Inst. Plant Prot., Budapest.

4812. Ward, J. F.
Black pepper.
[*Publ.*] *Minist. Agric. Lands, Jamaica*, 1960, pp. 16, bibl. 17.

Notes on all aspects of growing the crop, with recommendations for its extension in Jamaica.

4813. Gillot, J., and van Dingenen, A.
Le problème du tuteurage du poivrier (*Piper nigrum*). **(The problem of staking pepper vines.)**
Bull. Inf. I.N.É.A.C., 1960, **9**: 205-18, illus.

The advantages and drawbacks of stakes made from concrete, dead timber and living trees and of espalier training on wires are discussed in detail. With living supports a certain amount of shade for the vines and the soil is also obtained. A mulch of dry *Paspalum* grass was found to favour the development of *Rhizoctonia solani* and is not recommended.

4814. Raj, M. R. I.
Betelvine cultivation in India.
Madras agric. J., 1960, **47**: 463-73, bibl. 22.

Varieties, culture (including nutrition), yields, pests and diseases and marketing of *Piper betle* are discussed, with particular reference to differences in the practices current in the various parts of India.

4815. Irvine, J. E., and Delfel, N. E.
Flowering behaviour of vanilla.
Nature, 1961, **190**: 366, bibl. 7.

Observations on abandoned vines in Puerto Rico are described. Flowering occurred on both rambling and climbing forms and on ascending, horizontal and descending branches. The observations indicated that vanilla will flower and set fruit whether climbing or not, and that a change in the direction of growth is not necessary for flower formation.—U.S.D.A., Mayagüez, P.R.

Drug plants.

(*See also* 3680, 3681, 4086, 4891.)

4816. Williams, L. O.
Drug and condiment plants.
Agric. Handb. U.S. Dep. Agric. **172**, 1960, pp. 77, bibl. 27, illus.

Brief notes on each crop describe the plant, suitable soil, climate and culture, yield and preparation.

4817. Klein, R. M.
Plant tissue cultures, a possible source of plant constituents.
Econ. Bot., 1960, **14**: 286-9, bibl. 11.

The initiation and uniformity of cultures, media, culture methods and yields are discussed, together with a list of products, mainly drugs, which might be produced *in vitro*.—N.Y. bot. Gdn, Bronx Pk.

4818. Webb, L. J.
Some new records of medicinal plants used by the aborigines of tropical Queensland and New Guinea.
Proc. roy. Soc. Qd, 1961, **71**: 103-10, bibl. 1.

Notes supplementing the summary of the literature on medicinal and poisonous plants in Queensland made by the author in 1948 [see *H.A.*, 19: 3287p]. The species are classified under general pharmacological headings.—C.S.I.R.O., Brisbane.

4819. Horvath, L.
Medicinal plants in Hungary.
World Crops, 1961, **13**: 67-9, illus.

The production of ergot by artificially inoculating whole heads of rye in the field using a motorized machine is described briefly. A method has been evolved of extracting morphine from opium poppies which leaves the seed to be used as food. Chamomile (*Camilla hungarica* [=*Anthemis nobilis*?]), French lavender, English spearmint, *Solanum aviculare* (used for the production of medicinal hormones), and *Digitalis lanata* (a new variety containing glycoside "C") are also being cultivated.

4820. Pillai, N. C., Rao, G. J. S., and Sirsi, M.
Plant anticoagulants.
J. sci. industr. Res., India, 1957, **16C**: 106-7, bibl. 5.

Seven plants were tested. Aqueous extracts of papaw latex and fruit juice of colocynth (*Citrullus colocynthis*) were found to contain blood anticoagulants possessing no undesirable side effects. Extracts of *Phyllanthus emblica* leaves and of grapes were active, but undesirable.—Indian Inst. Sci., Bangalore.

4821. Chopra, C. L., Bhatia, M. C., and Chopra, I. C.
***In vitro* antibacterial activity of oils from Indian medicinal plants. I.**
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 780-1, bibl. 9.

Nine essential oils and one fixed oil were tested. The essential oils from *Pinus excelsa*, *P. longifolia*, *Cedrus deodara* and *Saussurea lappa* and the fixed oil from *Punica granatum* were the most active. —Reg. Res. Lab., Jammu, Kashmir.

4822. DESOLE, L.
Possibilità di sfruttamento delle piante officinali ed aromatiche—spontanee e coltivabili—in Sardegna. **(Possibilities of exploiting the wild and cultivated medicinal and essential-oil plants of Sardinia.)**
Studi Sassaresi, Sez. III, 1959 (issued 1960), **7**: 80-138, bibl. 92, illus.

Including notes on 35 species.

4823. DOMÍNGUEZ, X. A., AND OTHERS.
A phytochemical study of eight Mexican plants.
Econ. Bot., 1960, **14**: 157-9, bibl. 10.

Extracts of a mixture of powdered roots, stems and leaves in petroleum ether, ethanol and water were assayed separately for alkaloids. The plants tested were *Xanthium orientale*, *Amaranthus retroflexus*, *Nothalaena sinuata* var. *cochisensis*, *Melia azederach*, *Cordia boissieri*, *Jatropha spatulata*, *Agave schottii* and *Asclepias erosa*.—Dep. Quim., I.T.E.S.M., Monterrey, Nuevo León, Mexico.

4824. HOCKING, G. M.
Pakistan medicinal plants. III.
Qual. Plant. Mater. veg., 1961, **8**: 80-95, illus.

Parts I and II were noted in *H.A.*, 30: 903.

4825. SCHERTZ, K. F., AND OTHERS.
Seed extracts with agglutinating activity for human blood.
Econ. Bot., 1960, **14**: 232-40, bibl. 29.

45 out of the 311 species tested in Puerto Rico showed some degree of activity.

4826. KOTUHOV, JU. A.
Popular medicinal plants from the Altai. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 53-5.

Descriptions of 12 species in the Altai Botanical Gardens.

4827. TYLER, V. E., JR., AND ABOU-CHAAR, C. I.
Chemical characteristics of plant families of medicinal importance. I. Dicotyledons. [English, with German summary ½ p.]
Pharmazie, 1960, **15**: 628-34, bibl. 53.

A review.

4828. TYLER, V. E., JR.
The non-isotopic precursor feeding technique in the study of alkaloid biosynthesis.
Lloydia, 1960, **23**: 51-62, bibl. 31.

A review of published work, with special reference to the injection of amino-acids into solanaceous plants used in pharmacy.

4829. ROMEIKE, A.
Bisherige Ergebnisse auf dem Gebiet der Biogenese der Tropanalkaloide. **(Results so far in the field of tropine alkaloid biogenesis.)**
Pharmazie, 1960, **15**: 655-8, bibl. 78.

A review of knowledge on the biogenesis of alkaloids in the Solanaceae.

4830. HIROSI, O.
Results of experiments on the vernalization of medicinal and oil plants. [Russian.]
Agrobiologija, 1960, No. 3, pp. 427-39.

The vernalization temperature which produced the most rapid development in most of the winter crop plants studied, e.g. safflower, rape and poppy (*Papaver somniferum*), was 2–6° C. Peppermint (*Mentha arvensis* var. *piperascens*) differed from these, in that it was vernalized most successfully at 13–20° C. Summer crops including *Mosla japonica*, *Chenopodium ambrosioides* var. *anthelminticum* and *Datura stramonium* were successfully vernalized at 25–35° C. Vernalization usually increased the yield of the useful ingredients by 10–20%. Vernalization increased the essential oil contents of peppermint, *Mosla japonica* and *C. ambrosioides* by 10–25%, and the alkaloid content of opium poppies by 26%. The bitter components of *Capsicum annuum* were also much increased.

4831. KRONE, W.
Über den Feuchtigkeitsgehalt pflanzlicher Drogen. **(On the moisture content of plant drugs.)**
Pharmazie, 1960, **15**: 502-5, bibl. 2.

In preliminary tests moisture contents of 65 plant drugs were determined during storage, and results are presented as maximal, minimal and average moisture contents. Further tests showed that the moisture content of dried plant material which was artificially moistened dropped again to about the average after 2–3 days in storage.

4832. STRYCKERS, J.
Enkele nieuwe teelt technieken voor geneeskruiden. **(Some new cultural techniques for medicinal plants.)**
Land en TuinbJaarb. 1960-61, 1960, pp. 201-6, bibl. 3.

Excellent control of mono- and dicotyledonous annual weeds was obtained in angelica (*Angelica archangelica*) by propazine at 0·75 kg./ha. a.i. applied 3 weeks after planting. Chlorpropham was tolerated by angelica at rates up to 3 kg./ha. a.i. With valerian (*Valeriana officinalis*) chlorpropham at 2 kg./ha. and cyclo-octyl dimethyl urea (OMU) + butinol chlorphenyl carbamate (BiPC) at 1·1 kg./ha. were safest; propazine and simazine were toxic.—Rijkslandbouwhogeschool, Gent.—From *Weed Abstr.*, **10**, No. 65.

4833. IURACEC, A.
Beiträge zur Untersuchung des Heilwertes der in Rumänien wildwachsenden echten Kamille. **(An investigation of the therapeutic value of wild chamomile in Romania.)**
Pharmazie, 1960, **15**: 500-2, bibl. 27.

Contents of essential oil in chamomile [*Anthemis nobilis*] flower-heads ranged from 0·38% to 0·81%, averaging 0·58%. The chamazulin content of the essential oil ranged from 2·8% to 14·22%, averaging 7·77%. In the dried flower-heads chamazulin contents ranged from 0·014% to 0·103%, with an average content of 0·048%.—Inst. Cercetări Farm., Bucharest.

4834. HÁJKOVÁ, I., AND KOCÁBOVÁ, J.
Aklimatizace pelyňku přímořskeho na území Československa a možnost jeho hospodářského využití. (**The acclimatization of sea-wormwood in Czechoslovakia and the possibility of its industrial utilization.**) [Russian, German and English summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 701-6, bibl. 7.

It has been found that sea-wormwood (*Artemisia maritima*) may be readily grown under the climatic conditions of Czechoslovakia to provide santonin. Yields of both herbage and santonin were highest in the 2nd and 3rd years of cultivation and declined in the 4th year. Essential oil contents showed considerable variations.

4835. DIMITRIJEVIĆ, R.
Uvodjenje u kulturu velbilja (*Atropa belladonna* L.). (**Belladonna as a cultivated plant.**) [French summary 1 p.]
Arh. poljopr. Nauke, 1960, **13**(39): 104-7, bibl. 4.

It has been shown that *A. belladonna* can be grown in a dry climate and that treatment with F.Y.M. increases both the yield of stem and leaf and the alkaloid content. Mineral nutrients did not increase yields in the dry year of 1958, but raised the alkaloid content, an effect attributed to N and P but not K.—Fac. Agric., Belgrade.

4836. PRISTA, L. N., ALVES, A. C., AND DE ARAÚJO, M. F. C.
Cassia occidentalis L. Estudo dos seus compostos antraquinónicos. (***Cassia occidentalis*. Investigation on its anthraquinone compounds.**) [French and English summaries ¼ and ⅓ p.]
Garcia de Orta, 1959, **7**: 757-72, bibl. 33.

Emodin was found in the roots and seeds, and chrysophanic acid and a compound with the characteristics of 1:8-dihydroanthraquinone in the roots, leaves and seeds.

4837. SCHRAMM, L. C., AND SCHWARTING, A. E.
Alkaloid distribution in Colombian cinchonas.
Lloydia, 1961, **24**: 27-40, bibl. 8.

Of the main naturally-occurring species sampled *C. pitayensis* had a high, *C. officinalis* an intermediate, and *C. pubescens* a low alkaloid content. The alkaloid content of the bark was highest in trees growing at high altitudes.

4838. FISH, F.
Effects of gibberellic acid on the growth and alkaloidal content of *Datura stramonium* L.
J. Pharm. Pharmacol., 1960, **12**: 428-36, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1764.

GA, injected into growing plants, increased internode length, especially on the treated side, with some axial splitting. There was an increase in dry weight in the aerial parts, when plants were treated for a limited time, but not in plants treated over a long growing period. Yields of leaves and tops were not significantly increased, but there was a significant decrease in the percentage alkaloid content of the leaves and tops, particularly in those which had received the highest dose of GA.

4839. FUCHS, L., AND JACHS, H.
Untersuchungen über die fermentative Aktivität von Digitalisblättern. 5. Mitteilung über Digitalisglykoside. (**Studies on enzyme activity of digitalis leaves. Fifth report on digitalis glycosides.**)
Pharmazie, 1960, **15**: 648-50, bibl. 7.

Leaves of *Digitalis purpurea* dried at 40 and 70° C. contained an active digipurpidase. Leaves dried at 100° C. showed no enzyme activity. Water extracts of *D. lanata* leaves dried at room temperature showed different enzyme activities with plant material differing in origin. In one case after 72 hours' maceration a considerable quantity of lanatoside remained intact, whereas in another sample 1 hour's maceration broke down most of the lanatoside present.—Pharm. Inst. Univ., Wien.

4840. MOZA, B. K.
Identification and chromatographic separation of digitoxin, gitoxin and digoxin.
J. sci. industr. Res., India, 1958, **17B**: 202-3, bibl. 13.

The 3 secondary glycosides of *Digitalis lanata*.

4841. NEUWALD, F., DIDIER, H.-J., AND GRIMMER, G.
Column-chromatographic method for the determination of digitoxin in digitalis leaves. [German ?]
Pharm. Acta Helvet., 1960, **35**: 87-95, from *Anal. Abstr.*, 1960, **7**, Abstr. 4998.

4842. STEINEGGER, E., AND SONANINI, D.
Untersuchung der Flavone von *Hyoscyamus niger*. (**A study of the flavone of *Hyoscyamus niger*.**)
Pharmazie, 1960, **15**: 643-4, bibl. 2.

The flavonoid fraction consisting of a single substance, comprising 0·05% of the dry weight of the leaf, was identified as rutin.

4843. Salgues, R.
Recherches chimiques et toxicologiques nouvelles sur le genre *Hypericum* L. (Tourn.). **(New chemical and toxicological studies on the genus *Hypericum*.)** [German summary 1 p.]
Qual. Plant. Mater. veg., 1961, **8**: 38-64, bibl. 16.

The chemistry of several species of the genus *Hypericum* was investigated, with particular reference to the hydrocarbons in the roots, pigments, essential oils, higher alcohols and the poisoning of stock after eating *Hypericum perforatum*.

4844. McCleary, J. A., Sypherd, P. S., and Walkington, D. L.
Antibiotic activity of an extract of peyote (*Lophophora williamii* (Lemaire) Coulter).
Econ. Bot., 1960, **14**: 247-9, bibl. 10.

A water-soluble crystalline substance, separated from an ethanol extract, exhibited antibiotic activity against a wide spectrum of bacteria and a species of the imperfect fungi. The name peyocactin has been given to the principal antimicrobial component of this partially purified substance. Of particular interest was its inhibitory action against 18 strains of *Staphylococcus aureus* resistant to penicillin. [From authors' summary.] —Ariz. St. Univ., Tempe.

4845. Laumas, K. R., and Seshadri, T. R.
Chemical components of the bark of *Phyllanthus emblica* Linn.
J. sci. industr. Res., India, 1958, **17B**: 167-8, bibl. 1.

Petroleum extraction yielded lupeol, which in acetone extraction yielded leucodelphinidin, the properties of which are considered in some detail.

4846. Wasicky, R., and Wasicky, M.
Polygala brasiliensis L., eine saponinreiche *Polygala*-Art Brasiliens. **(*Polygala brasiliensis*, a Brazilian species of *Polygala* rich in saponins.)** [English summary ½ p.]
Qual. Plant. Mater. veg., 1961, **8**: 65-79, bibl. 13, illus.

High values in roots, leaves and especially inflorescences.

4847. Pfeifer, S., and Heydenreich, K.
Über das Alkaloidspektrum keimender Mohnpflanzen. **(The alkaloid spectrum of germinating poppies.)**
Naturwissenschaften, 1961, **48**: 222-3, bibl. 13.

Figures are given for the contents of morphine, codeine, thebaine, narcotoline and narcotine in poppy seedlings of 6 varieties. Thebaine was present in much larger amounts than any of the others, and it is suggested that it is an intermediate in the metabolism of the morphine alkaloids. [See also *H.A.*, 30: 2493.]—Pharmazeut. Inst. Humboldt-Univ., Berlin.

4848. Voškeruša, J.
Untersuchungen über den Morphingehalt in Mohnkapseln. **(Investigations on the morphine content of poppy capsules.)**
Pharmazie, 1960, **15**: 552-8, bibl. 24.

Relationships between seed yield, oil content and morphine content were determined. The morphine content was influenced by environmental and genetical factors. The highest morphine content, 0·469%, was found in the Czech variety Dubský stříbrošedý.—Czech. Acad. agric. Sci., Opava.

4849. Kleinschmidt, G.
Beiträge zur Physiologie der Mohnalkaloide. Die Demethylierung des Kodeins zum Morphin in der Mohnpflanze. **(Contributions to the physiology of poppy alkaloids. The demethylation of codeine to morphine in the poppy plant.)**
Pharmazie, 1960, **15**: 663-4, bibl. 6.

The conversion of C^{14}-labelled codeine to morphine was demonstrated in isolated poppy leaves and shown to be analogous to the nicotine-nornicotine conversion in tobacco. Labelled tyrosine was shown to produce both morphine and codeine in the poppy. Demethylation of codeine taking place in the mature leaves was unidirectional, there being no equilibrium between methylation and demethylation.—Inst. Biochem. Pfl., Halle.

4850. Bailey, V. L.
Historical review of *Ptelea trifoliata* in botanical and medical literature.
Econ. Bot., 1960, **14**: 180-8, bibl. 42, illus.

Nineteenth century literature refers to "ptelein" or *Ptelea* bark as being useful as a tonic, and for the treatment of fevers and certain chronic ailments. The fruits are aromatic and bitter and have been used as a substitute for hops. Early chemical analyses indicated the presence of berberine, tannic and gallic acids, arginine, saponins, resins and volatile oil as the active ingredients, but these findings await confirmation.—Detroit Inst. Tech.

4851. Bhore, D. P.
Indian rauwolfias and their botanical aspects.
Poona agric. Coll. Mag., 1960, **51**(2): 1-4, bibl. 13, illus.

Rauwolfia serpentina, *R. canescens*, *R. densiflora* and *R. micrantha* described.

4852. Mia, A. J.
Structure of the shoot apex of *Rauwolfia vomitoria*.
Bot. Gaz., 1960, **122**: 121-4, bibl. 22, plus 5 pp. plates.

See also *H.A.*, 30: 5744.

4853. Popelak, A., and others.
Rescidin, ein Alkaloid aus *Rauwolfia vomitoria* Afz. (**Rescidine, an alkaloid from *Rauwolfia vomitoria*.**)
Naturwissenschaften, 1961, **48**: 73-4, bibl. 3.
Rescidine, a hitherto undescribed alkaloid, was isolated from the roots of *R. vomitoria*. Its empirical formula, physical properties and the reactions used in characterizing its structure are described.—Firma C. F. Boehringer, Mannheim.

4854. Aleksandrova, A. V.
The biology of *Scopolia tangutica* Maxim. [Russian.]
Bot. Žurnal, 1960, **45**: 1667-72, bibl. 11, illus.
In 2-year-old *S. tangutica* the highest alkaloid content was found in the leaves. The rhizomes came next and the stems last. The predominant alkaloids were tropanes, i.e. atropine, hyoscyamine and scopolamine, the ratio of these to the total alkaloids being higher in the leaves and stems than in the rhizomes. Cultivation trials, flower biology, pollination and seasonal development are described. Plants propagated from root cuttings had smaller leaf blades but attained the same height as those raised from seed. Stem cuttings normally rooted poorly, but when treated with heteroauxin at 50 mg./l. 80% strike was obtained.

4855. Schenk, W., and Schütte, H. R.
4-Aminopipecolinsäure, eine neue basische Iminosäure in *Strophanthus scandens*. (**4-Aminopipecolinic acid, a new basic imino acid in *Strophanthus scandens*.**)
Naturwissenschaften, 1961, **48**: 223, bibl. 5.

4856. Battersby, A. R., and Yeowell, D. A.
Alkaloids of calabash curare: the structure of macusine-B.
Proc. chem. Soc., Lond., January 1961, pp. 17-18, bibl. 18.
A newly isolated quaternary alkaloid from *Strychnos toxifera* [see also *H.A.*, 30: 5746].

4857. Hogg, R., Beal, J. L., and Cava, M. P.
A study of the alkaloids of *Thalictrum*. I. Isolation of some quaternary alkaloids from *Thalictrum dasycarpum* var. *hypoglaucum*.
Lloydia, 1961, **24**: 45-54, bibl. 40.
Berberine and magnoflorine.

4858. Kupchan, S. M., Zimmerman, J. H., and Afonso, A.
The alkaloids and taxonomy of *Veratrum* and related genera.
Lloydia, 1961, **24**: 1-26, bibl. 159.
Includes a survey of the occurrence and known structure of the alkaloids.

Essential oils.

(*See also* 4772, 4821, 4822, 4830, 4833, 4834, 4843, 5077, 5215-5218, 5572.)

4859. Nigam, S. S., and Purohit, R. M.
Chemical examination of the essential oil derived from the seeds of *Amomum subulatum* Roxb.
Perfum. essent. Oil Rec., 1960, **51**: 121-3, bibl. 19.
The fruits are used as a substitute for cardamoms. The seeds yielded 2·5% of oil, the main constituent of which was cineole.—Dep. Chem., Univ. Sangar, M.P.

4860. Gottlieb, O. R., and Taveira Magalhães, M.
Essential oil of the bark and wood of *Aniba canelilla*.
Perfum. essent. Oil Rec., 1960, **51**: 69-70, bibl. 8.
Yields of 0·7–1·0% of an oil containing mainly 1-nitro-2-phenylethane. [See also *H.A.*, 31: 2804.]

4861. Fluck, A. A. J., Mitchell, W., and Perry, H. M.
Composition of buchu leaf oil.
J. Sci. Food Agric., 1961, **12**: 290-2, bibl. 6.
An essential oil from *Barosma betulina* and *B. crenulata*.

4862. Noguchi, M., and Kitajima, M.
On the seasonal changes of the essential oil content in camphor tree leaves. [Japanese, with English summary.]
J. Jap. For. Soc., 1959, **41**: 488-94, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 45,758.
Camphor, safrole and total essential oil contents of *Cinnamomum camphora* were determined monthly from April, 1958, until April, 1959, by means of photometric titration and infra-red spectroscopic methods developed by the authors. The camphor content increased rapidly from April to June, decreased slightly during July and August, increased again from September until January, when it decreased a little. The safrole content was very small and showed only very slight variation throughout the year. Total essential oils showed the same trend as camphor. Some differences were found in the camphor and safrole contents of the pericarp of various camphor trees from Japan and Formosa.—Japan Monopoly Corp., Cent. Res. Inst., Tokyo.

4863. Paul, A., and others.
Terpenoids XX. Examination of costus root oil.
Perfum. essent. Oil Rec., 1960, **51**: 115-20, bibl. 21.
By a new low temperature extraction method, which is described, an essential oil free from polymerization has been obtained from the roots

of *Saussurea lappa*. Its components were isolated by crystallization in stages and by various forms of chromatography.—Nat. chem. Lab., Poona-8.

4864. BASLAS, K. K.
Essential oil from the fruits of *Cupressus sempervirens* Linn.
Perfum. essent. Oil Rec., 1959, **50**: 823-7, bibl. 11.

Oil found to contain 14 terpene derivatives, including a new bicyclic sesquiterpene, cupressusene, and 3 of doubtful identity.

4865. CUTTING, C. V.
A note on the production of geranium oil.
Nyasaland Fmr For., 1961, **5**(3): 23-4.

Leaf development should be encouraged as the leaves contain most of the oil. Cutting should be done late in the day and preferably after a sunny day. Irrigation and N and P fertilization may increase yield and oil content, but often oil quality is reduced. Liming acid soils to bring the pH to 6·5–8·0 is desirable. Constituents and characteristics of the oil are given.

4866. NIGAM, I. C., GUPTA, G. N., AND DHINGRA, D. R.
Chemical examination of the essential oil from laurel (*Laurus nobilis*) berries.
Perfum. essent. Oil Rec., 1960, **51**: 351-4, bibl. 7.

Details of the fractionation and identification of components; oil yield was 4·1%.

4867. SACCO, T.
Il *Cymbopogon citratus*, Stapf. nell'agricoltura e nell'industria somala. (**Lemongrass (*Cymbopogon citratus*) in the agriculture and industry of Somalia.**)
Riv. Agric. subtrop., 1959, **53**: 428-38, bibl. 10, illus.

Cultural practices, and composition and physical properties of the essential oil.

4868. FEARNS, E. C., MITCHELL, D. A., AND MITZNER, B. M.
Ultra-violet determination of citral in lemongrass oils which contain myrcene.
Perfum. essent. Oil Rec., 1960, **51**: 355-6, bibl. 1.

Procedure described, with details of citral and myrcene found in lemongrass oils from India and Guatemala.

4869. ELLIS, N. K.
Peppermint and spearmint production.
Econ. Bot., 1960, **14**: 280-5.

The history of peppermint production, species and types, culture for mint production (including details of suitable day length and soil moisture levels) and diseases of the crop are discussed.—Purdue agric. Exp. Stat., Lafayette, Ind.

4870. GONZALEZ, E. E., AND GJERSTAD, G.
Metabolic and morphological changes induced by gibberellic acid on spearmint.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 782-5, bibl. 8, illus.

A single foliar spray of GA (50 p.p.m.) increased linear growth of spearmint plants by 258%, increased dry matter and decreased water content, total chlorophyll content and the amount of volatile oil, but did not alter the carvone content of the oil. No significant difference in response was observed between 10, 50 or 100 p.p.m. of GA.—Univ. Texas, Austin.

4871. LATYPOV, A. G.
The nutrition of mint and water parsnip in relation to essential oil accumulation. [Russian, with English summary 8 lines.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 3, pp. 224-33, bibl. 19, illus.

In fertilizer experiments with the essential oil plants *Mentha piperita* and *Sium latifolium* it was found that an ammoniacal form of N stimulated the production of essential oils to a greater extent than nitrate N. Potassium and ammonium sulphates were more effective than the chlorides in increasing oil production. These fertilizers not only increased the essential oil content but also improved its composition. The increase in oil content was estimated at 60–85%.

4872. REITSEMA, R. H., AND OTHERS.
Essential oil synthesis in mint.
J. pharm. Sci.,* 1961, **50**: 18-21, bibl. 3.

Menthol and other constituents of peppermint oil were detected in measurable quantities within 15 minutes of exposing mint plants to an atmosphere of $C^{14}O_2$. Production continued for several hours in the dark and after the cessation of photosynthesis. Menthone, limonene, pinene, but not menthol, were shown to undergo numerous transformations in the plant.—A. M. Todd Co., Kalamazoo, Mich.

4873. GOULD, G. E.
Problems in the control of mint insects.
J. econ. Ent., 1960, **53**: 526-31, bibl. 1, illus.

Of the 54 species of pests found on peppermint and spearmint in Indiana only cutworms and the mint looper (*Raphoplusia ou*) have been a serious problem in the past 10 years. Chlordane, aldrin, dieldrin and heptachlor gave good control of cutworms on new growth in late April and early May and again after the crop was cut in July or August. Of insecticides tested against the looper dieldrin, heptachlor and DDT were the best, 2 applications with a 10-day interval in late June giving excellent control. Malathion was effective against spider mites and to some extent against plant bugs and leafhoppers. Problems of residues are discussed, and as regards possible off-flavours in the oil the following materials proved suitable for use: DDT, dieldrin, chlordane, heptachlor, toxaphene, Strobane, malathion, parathion, EPN-300 and Chlorthion.—Purdue Univ., Lafayette, Ind.

---

* Formerly *J. Amer. pharm. Ass., sci. Ed.*

4874. Chaudhry, G. R., Sharma, V. N., and Kaul, K. N.
Chemical examination of the essential oil from *Nardostachys jatamanshi*.
J. sci. industr. Res., India, 1958, **17B**: 473-4, bibl. 2.

Chemical and physical characteristics of the various fractions.

4875. Sacco, T.
Primi risultati sulla introduzione in Somalia, come pianta essenziera, dell'*Ocimum basilicum* L. var. *crispum* Cam. **(Preliminary results of the introduction of *Ocimum basilicum* var. *crispum* as an essential-oil plant into Somalia.)**
Riv. Agric. subtrop., 1960, **54**: 76-80, bibl. 8, illus.

Results very promising; the physico-chemical characteristics of the oil are given in detail.

4876. Baslas, K. K.
Essential oil from the roots of *Pavonia odorata* Willd.
Perfum. essent. Oil Rec., 1959, **50**: 896-7, bibl. 2.

Mainly isovaleric acid, but 6 other derivatives were isolated including a new sesquiterpene alcohol, pavonenol.

4877. Yeh, P.-H.
A new perilla oil containing mainly (—)-piperitone and the stereospecific reduction of the α,β-unsaturated ketone.
Perfum. essent. Oil Rec., 1960, **51**: 293-6, bibl. 18, illus.

From *Perilla frutescens*, indigenous to Taiwan.

4878. Sacco, T.
Possibilità di incremento della *Vetiveria zizanioides* Stapf. della Somalia, come pianta essenziera. **(Possibilities of extending the cultivation of *Vetiveria zizanioides* as an essential-oil plant in Somalia.)**
Riv. Agric. subtrop., 1960, **54**: 81-7, bibl. 9, illus.

Cultural practices and distillation are briefly described. The oil from the Somali plants is of sufficiently high quality to merit extended production.

Fibres.

(*See also* 3709.)

4879. Larsen, A.
Stammeforsøg med spindhamp 1951-1956. **(Variety trials with hemp, 1951-1956.)** [English summary ½ p.]
Tidsskr. Planteavl, 1960, **64**: 847-55, bibl. 2.

Yields of von Sengbusch (a monoecious hemp) were far superior to those of Dr. Schurigs, which is a normal, predominantly dioecious type.

4880. Lelakis, P.
A study of polyploid plants of *Cannabis sativa* obtained by the application of colchicine. [In Greek, with French summary ⅓ p.]
Reprint from *Delt. agrotik. Trap.*, 1960, No. 117, pp. 19, bibl. 45, illus.

Immersion of the tips of 1-week-old seedlings of hemp for 3 hours in a 0·5% colchicine solution was more effective in inducing polyploidy than soaking the seeds or immersing whole seedlings. The treated plants became tetraploid and produced triploid progenies when crossed with the parent type. About 90% of these triploid plants were monoecious and diclinous.

4881. Ferri, F.
Microflora dei semi di canapa. **(The microflora of hemp seed.)**
Progr. agric., Bologna, 1961, **7**: 349-56, illus.

The species of fungi found on hemp seeds from different sources are listed, and their pathogenicity in vermiculite, soil and sterilized soil is tabulated. None of the seed disinfectants used completely eradicated the fungi, but the best treatment was immersion for 5–10 min. in 0·1% corrosive sublimate (mercuric chloride). In ordinary soil seeds free from visible infection until the radicle had reached a length of 1–2 mm. were not attacked by any of the fungi inoculated into the soil, but only by *Fusarium roseum*, which was present inside the seeds. Very few species attacked seeds in soil inoculated after sterilization, but several gained entry from vermiculite. *Alternaria tenuis* and *Rhizopus nigricans* were the only pathogenic fungi causing appreciable mortality in the open after seed treatment with corrosive sublimate.—Ist. Pat. veg., Univ. Bologna.

4882. Herich, R., and Priehradný, S.
Príspevok k biochemickej diferenciácii pohlavia konopí (*Cannabis sativa* L.). Predbežná zpráva. **(A contribution to the biochemical differentiation of sex in hemp. Preliminary communication.)** [Russian and German summaries ½ p. each.]
Erdelský, K., and Herich, R.
Idem. II. [Russian and German summaries ½ p. each.]
Reprints from *Biológia, Bratislava*, 1955, **10**: 346-9, bibl. 12, and 1956, **11**: 111-15, bibl. 5.

The first paper deals with variations found in the sugar content and reducing capacity of tissues of the root and aerial parts of male, female and monoecious hemp plants. In the second paper differences in N, P and K contents are recorded and discussed in relation to sex differentiation.

4883. Herich, R.
K problému diferenciácie pohlavia rastlin. (Predbežná zpráva.) **(The problem of sex differentiation in plants. (Preliminary communication.))** [Russian and German summaries ⅓ p. each.]
Reprint from *Biológia, Bratislava*, 1956, **11**: 220-4, bibl. 13.

By soaking the seeds of the hemp variety Polyploidná in solutions of $MnSO_4$, KBr, KI or H_2O_2 the percentage of female plants was reduced and that of male and monoecious plants increased. In the variety Šumperská seed treatment also reduced the percentage of female plants and increased that of male plants.

4884. Herich, R.
K problému pohlavnej determinácie a diferenciácie rastlín. I. Pôsobenie bóru na priebeh pohlavnej diferenciácie konopí (*Cannabis sativa* L.). **(The problem of sex determination and differentiation in plants. I. The effect of boron on the process of sex differentiation in hemp.)** [Russian and German summaries ⅓ p. each.]
Reprint from *Acta Fac. Rer. Nat. Univ. Comenianae, Bot.*, 1956, **1**: 419-25, bibl. 30, illus.

Soaking the seeds of 2 hemp varieties in 0·2 and 0·5% H_3BO_3 gave results similar to those obtained with $MnSO_4$, etc. [see abstract above].

4885. Köhler, D.
Ein Beitrag zur Physiologie und Genetik der Geschlechtsausprägung von *Cannabis sativa.* **(A contribution to the physiology and genetics of sex expression in hemp.)**
Planta, 1961, **56**: 150-73, bibl. 28, illus.

An investigation on the effects of different photoperiods and of genetic factors on sex expression in hemp.

4886. Conrad, K., and Mothes, K.
Über geschlechtsgebundene Unterschiede im Auxin-Gehalt diözischer Hanfpflanzen. **(Sex-linked differences in the auxin content of dioecious hemp.)**
Naturwissenschaften, 1961, **48**: 26-7, bibl. 6.

Male and female plants of hemp were analysed for their auxin content after flowering and before the male plants started to die back. Auxin as the IAA-equivalent per kg. of fresh weight was only 6 and 8 in male plants compared with 180 and 220 in female plants.—Inst. allgem. Bot., Univ. Halle.

4887. de Ropp, R. S.
Chromatographic separation of the phenolic compounds of *Cannabis sativa.*
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 756-8, bibl. 6.

The solids from a methanolic extract were adsorbed on Florisil and eluted with benzene to yield a red oil, which was then separated into 8 components some of which had pharmacological activity. The application of the method for the preparation of pure cannabinol and tetrahydrocannabinol is described.—Amer. Cyanamid Co., Pearl River, N.Y.

4888. Puri, Y. P.
Flowering habit, pollen characteristics, and seed germination of *Phormium tenax* Forster.
Diss. Abstr., 1960, **21**: 739, being *L.C. Card No. Mic.* 60-3351 of 196 pp.

Flower opening and pollen shedding were studied at 3 places in Oregon, and the observations made are recorded. Pollen germination and tube growth were optimal on a medium of 1% agar and 8–12% sugar, with pH 6·2 to 6·4. The germination and tube growth of groups of grains were better than those of single grains. Pollen collected 6 hours after the start of anther exsertion could be stored for 181 days at 0° C. and 35–40% R.H., giving 45% viability. Keeping quality was related to the stage of development of the pollen. Self-pollinated seeds could be obtained by hand pollination or by bee pollination. Wind was also a pollinating agent when the temperature was high and R.H. was low. The optimum alternating temperatures for seed germination were 15° to 25° C. and 15° to 30° C.; rates of seed germination were slow in constant temperatures of 5°, 10°, 15°, 20° and 30° C. Arasan was the best fungicide tested for seed protection. Seed germination, seed size and seedling vigour increased, and moisture content decreased, with increments in the maturity of the seed up to 70 and 85 days from anthesis in 1957 and 1958, respectively. Viability and seedling vigour were directly proportional to seed weight. Seeds with 8% moisture gave 80% germination after storage at 3° C. for one year.—Ore. St. Coll.

4889. Allison, R. V.
Summary of advances in fiber crops production in south Florida during the past twenty years.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 295-304, bibl. 18, illus.

Mainly concerned with the mechanization of ramie growing.

4890. Pate, J. B., Joyner, J. F., and Seale, C. C.
Vigor in an interspecific hybrid of *Sansevieria.*
Econ. Bot., 1960, **14**: 175-9, bibl. 9, illus.

The F_1 of *S. trifasciata* × *S. deserti* yielded more fibre, of equal or better quality, than either parent in trials in south Florida. [For an earlier account, see *H.A.*, 30: 4079.]

4891. DAWIDAR, A. A., AND FAYEZ, M. B. E.
Steroid sapogenins. III. Distribution of steroid sapogenins in the sisal plant.
Arch. Biochem. Biophys., 1961, **92**: 420-3, bibl. 8.

It is suggested that, in the bulbils, gitogenin (as the first generation in sapogenin biogenesis) gives rise to tigogenin (as second generation), which is transformed in the course of the long life of the plant to hecogenin and neotigogenin (as third generation). At the end of the life cycle neotigogenin and hecogenin of the old leaves are transformed by a reverse mechanism to tigogenin in the flowering top, which subsequently changes to gitogenin. It has also been shown that hecogenin is most abundant (0·235%) in the leaves of the old plant. [From authors' abstract.]—Nat. Res. Centre, Dokki, Cairo.

4892. THOMBRE, M. V., AND DESAI, M. C.
A preliminary note on autopolyploidy in *Agave cantala* L.
Sci. and Cult., 1960, **26**: 276-7, bibl. 3, illus.

Germinating seeds treated with 0·4% colchicine for 6 hours produced plants with 2n = 90. These tetraploids had thicker and broader leaves than the diploids.—Coll. Agric., Poona.

Hops.

(*See also* 3771, 3809, 5568, 5573.)

4893. DARLING, H. S.
Hop research and recent developments in hop growing.
Agriculture, Lond., 1961, **67**: 557-62, bibl. 2.

A short account is given of the effects of progressive wilt and mechanical harvesting, which have necessitated finding a substitute for the Fuggle variety that is suitable for machine picking and resistant to diseases. Mechanical harvesting has also stimulated work on breeding for firmer, seedless cones as well as studies on crop height and spacing.—Wye Coll., Ashford, Kent.

4894. WYE COLLEGE.
Annual Report of the Department of Hop Research from 1st April, 1959 to 31st March, 1960, 1960, pp. 154, bibls, illus.

Plant breeding: New, potentially wilt-tolerant replacements were distributed for farm trials and full-scale brewing trials; a promising triploid seedling of Bullion susceptible to wilt was also released for trial; breeding for resistance to downy mildew and tolerance to verticillium wilt was continued; triploid seedlings showed more wilt symptoms than diploid seedlings. *Field experimentation:* In a brick-earth soil high in available P and K the highest yields were obtained with the lowest levels of NPK manuring; applications of magnesium sulphate had no beneficial effect on the market value of a crop on a soil very low in available Mg. *Entomology:* Demeton methyl and dimefox gave much better control of aphids than derris. [See also separate abstracts below.]

4895. FARRAR, R. F.
The seed content of triploid hops.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 115-19, bibl. 7.

The triploid hops examined, while not seedless, had a much reduced seed content compared with normal diploid commercial varieties. Some aspects of this finding are discussed. [From author's summary. For earlier work see *H.A.*, 29: 657.]

4896. GARBUZOVA, D. A., AND ŠARONINA, A. P.
The effect of differences in the source material used in the vegetative propagation of hops. [Russian.]
Agrobiologija, 1960, No. 3, pp. 366-70.

Plants raised from cuttings taken from "elite" [selected, superior] plants gave yields 8·9–22·2% higher than plants from commercially produced cuttings, thereby demonstrating the effect of the conditions under which the maternal plant was grown. Cuttings from the second and third internodes rooted and yielded better than those from the fifth and sixth internodes. Plants from rhizome cuttings gave the highest yields and were resistant to root decay. Plants from rhizome and shoot cuttings had high sugar contents and were resistant to unfavourable autumn-winter conditions.

4897. WILLIAMS, I. H., AND FARRAR, R. F.
Hop propagation. III. The growth of suitable material for the provision of soft-wood cuttings for mist propagation and the subsequent behaviour of the cuttings in the field.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 48-53, bibl. 5.

Techniques evolved to supply material for softwood cuttings at different times of the year are described. The development of the rooted cuttings when planted out in the field at intervals during the season is discussed. Soft-wood cuttings planted in the field after propagation in the mist unit compared well at the end of the growing season with bedded setts grown in the normal commercial manner. [Authors' summary. For part II, see *H.A.*, 30: 5767.]

4898. THOMPSON, F. C., BAILEY, P. H., AND WILLIAMS, I. H.
Height of wirework and spacing trial No. II: First progress report. Part I. Introduction. Part 2. Cultural data including yield and resin values. Part 3. Comparison of half plots picked by hand and machine. Part 4. A note on growth and development.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 54-5, bibl. 1, pp. 56-9, bibl. 1, pp. 60-7, and pp. 68-9.

Hop varieties Fuggle N, Northern Brewer and Bullion were planted at spacings of 6½ ft., 7½ ft. and 9 ft., all with a cross spacing of 6½ ft. to facilitate cross cultivation. The heights of the wirework compared were 14 ft., 16 ft. and 18 ft. Fuggle N and Bullion both showed a greater benefit from higher wirework and wider spacings. Fuggle N and Northern Brewer cropped best with wirework at 16 ft. With wider spacing the increase in yield per plant did not compensate for the smaller number of plants per acre. Use of a picking machine gave similar results to hand picking and did not add to variability. Wider spacing resulted in the development of cones on laterals lower down the bines, and increasing the height of the wirework resulted in a more even distribution of cones along the whole bines.

4899. Bailey, P. H., and Payne, P. C. J.
Note on a short experiment on the strength of hop anchors—Wye, March, 1960.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 82-93, bibl. 3, illus.

New anchors of the standard wood block type failed at an average maximum load of 7,900 lb., which is well above the yield load of new anchor wire. Proprietary anchors failed at 2,800 lb. [From authors' summary.]

4900. Hoed, J., and Speelers, A.
Essais comparatifs de culture du houblon sur 1 ou 2 fils. **(Comparative trials on hop growing with one or two wires.)**
Rev. Agric., Brux., 1960, **13**: 631-8, illus.

In a 5-year trial with Replant Saaz clone No. 25 plants trained on 2 vertical wires disposed in a V gave an average yield of dry hops 381·5 kg. per ha. greater than plants trained on the normal single-wire method, namely, 1,813·5 kg. compared with 1,432 kg. per 3,250 plants per ha. However, the two-wire method requires more labour and more wire and presents greater difficulty in operation.—Inst. nat. belg. Houblon.

4901. Williams, I. H.
Changes in the carbohydrate balance of the hop (*Humulus lupulus* L.) in relation to the annual growth cycle in young plants.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 98-106, bibl. 5, illus.

Trials on young Fuggle hop plants grown in pots in the open showed that fluctuations in carbohydrate accumulation were related to changes in the annual growth cycle, and that young, newly planted hops should be allowed to carry as much healthy leaf as possible in the first year in the field. Thus, on young plants hand-picking should be practised, leaving the leaves intact to continue carbohydrate storage until the shoots die naturally. [For earlier work, see *H.A.*, 30: 5769.]

4902. Zelenka, V., and Fiala, V.
Jak a kdy roste chmel? **(How and when does the hop grow?)**
Chmelařství, 1960, **33**: 172-3.

According to some authors hops can grow as much as 26 cm. in 24 hours. Measurements made during 24-hour periods at the end of May and middle of June showed 6·29 cm. growth at a mean temperature of 12·3° C. and 13·56 cm. at 19·2° C., respectively. Growth was most intensive during the late afternoon and evening; the maximum growth during 2 hours in May was 11·2 mm. (between 4 and 6 p.m. at 15·7–16·3° C.) and in June 18·3 mm. (between 6 and 8 p.m. at 19·4–18·3° C.). The opening of the stomata during the same 24-hour periods are illustrated graphically.

4903. Williams, I. H., and Brown, J. F.
Hop irrigation—progress report.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 70-81, bibl. 81.

The first 2 years' results of long-term experiments are discussed. Irrigation gave increased yields in 1959. Provisional conclusions are that commercial irrigation of young plants up to 3 years of age may assist establishment and increase yields, especially when May and June are very dry. With older hops the greatest effects were seen on deep soils of good texture.

4904. Beneš, J.
Závlahy chmele jako prostředek k vyšším výnosům. **(Irrigation of hops as a means of increasing yields.)**
Chmela˘ství, 1960, **33**: 86-7, illus.

Sprinkler irrigation, preferably during the night, is considered ideal, but furrow irrigation is cheaper and more generally used in Czechoslovakia.

4905. Bonnet, J., and Coppens, R.
L'absorption des éléments nutritifs par le houblon. **(The absorption of nutrient elements by the hop.)**
Bull. Inst. agron. Gembloux, 1960, **28**: 227-58.

Extensive analytical data covering several seasons are tabulated. The composition of the whole plant and also of the cones at various times throughout the growing season is given for various well-known varieties; the amount of each element removed from the soil by the whole plant and the cones is also given. The absorption of nutrients takes place principally during the 2 months prior to harvest. Varieties differed considerably in their nutrient requirements, but for all varieties Ca and K were the principal elements taken up by the plant, followed by N. The absorption of P and Mg followed very similar courses. For flowering P, N, K and Mg were the most important nutrients, with Ca much less important. Data on Mn uptake were very inconsistent.

4906. Marocke, R.
Disturbance of mineral uptake of hops in a dry year. Spontaneous potassium deficiencies. [French ?]
C.R. Acad. Sci., Paris, 1960, **251**: 786-7, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-167-8.

Following a very dry July in 1959 symptoms of K deficiency were observed in several hop varieties, growing chiefly in soils with an exchangeable K content of not less than 0·2%: symptoms were noted only in occasional plants. The deficiency is ascribed to a localized shortage of assimilable K in the soil.

4907. Kubo, S., Ukawa, S., and Kamekura, S.
Boron deficiency in Japanese hop gardens.
Rep. Res. Lab. Kirin Brewery Co., Yokohama, 1959, No. 2, pp. 1-10, from abstr. in *J. Inst. Brew.*, 1961, **67**: 71-2.

Symptoms of a hop disease, that has proved troublesome in Japan, include distortion of leaves, cessation of extension growth, weakness of bines and laterals and short internodes. On the lower part of the shoots, fissures or dark green spots appear, and the collenchyma in these areas, as well as in affected growing points, shows abnormal swelling and destruction of cells. A dry spring increased, and a wet one decreased, the rate of spread of this disease, to which 3- and 4-year-old plants were more susceptible than those of other ages. Native Japanese, Saaz and Hallertau hops were more susceptible than Californian or Cluster hops. Conditions conducive to the disease included shallow cultivation, poor supplies of FYM, and a subsoil of sand or gravel or of volcanic or granitic origin. The disease was found to be due to a deficiency of available B, and applications of 5–20 g. borax per plant, spread on the hills but not directly on the plants, restored healthy growth. An excess of B decreased the content of α-resin and the fragrance of the cones. The soil and the manures applied should be analysed, and the borax dressing adjusted so as to raise the available B in the soil to 0·6–0·8 p.p.m.

4908. Zattler, F.
Ovlivňování jakosti hlávek mikroklimatickými činiteli. **(The influence of micro-climatic factors on cone quality.)**
Chmelařství, 1960, **33**: 134-6, illus.
Influence of micro-climatic conditions on the bitter substances of the hop cone. [German ?]
Brauwelt, 1960, pp. 1402-5, from abstr. in *J. Inst. Brew.*, 1961, **67**: 72.

At the Experimental Hop Farm at Hüll, Bavaria, 4 established hop varieties and 3 newly bred selections were grown along the outer wall of a glasshouse, and shortly before flowering every second plant was trained into the slightly shaded house. The cones developing both inside and outside the house were picked at the same time. With the 4 named varieties the resin and bitter substance contents were higher in the cones developing under glass, though the increases varied considerably between the varieties. Of the 3 selections one showed a small favourable reaction to cone development under glass, but the other two had reduced resins and bitter values. Of the conditions prevailing in the glasshouse the temperature (increased) and humidity (reduced) had a greater influence on cone composition than did the reduction of light intensity.

4909. Lebreton, P., and Michel, G.
Biogénèse des tannins leucoanthocyaniques du houblon. **(Biogenesis of the leucoanthocyanidin tannins of hops.)**
Proc. 3rd int. Congr. Ferm. Ind., 1958, pp. 141-52, from abstr. in *Wallerstein Lab. Commun.*, 1960, **23**: 224.

The active synthesizing centre of these leucoderivatives was found to be the leaf, the anthocyanogen content therein passing through 2 maxima in June and August, and 2 minima in July and September, corresponding to the appearance and maturity of the cones, respectively.

4910. Průša, V.
K problematice virové kadeřavosti chmele. **(The problem of hop leaf curl.)**
Chmelařství, 1960, **33**: 171-2, illus.

Curl, probably identical with nettlehead, is the most serious virus disease of hops in Czechoslovakia. The catalase activity of leaves from diseased plants was not found to be increased, as reported by other authors [see next abstract], and visual observation remains the only safe method of identification. Evidence on the mode of spread is conflicting, but the possible role of *Empoasca flavescens* is mentioned. For control the usual precautionary measures and the removal of affected plants followed by replanting are suggested.

4911. Jermoljev, E., and Kříž, J.
Aktivita katalázy jako indikátor virové kadeřavosti chmele. **(Catalase activity as an indicator of the curl virus in hops.)** [Russian and German summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 1163-74, bibl. 3, illus.

Enhanced catalase activity can be used to diagnose the presence of the curl virus with 96% accuracy, even where symptoms are masked by good fertilization and cultural practices. [See also *H.A.*, 28: 1643.]

4912. Legg, J. T.
The influence of a latent virus on the development of nettlehead disease in hop.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 106-7, bibl. 2, illus.

Plants of the hop varieties Fuggle and Bramling became more sensitive to nettlehead virus after they were grafted with scions of the variety Early Prolific. The extreme sensitivity of the latter appears to be due to a latent virus (termed hop latent virus X), which shortens the incubation period of nettlehead virus and may also increase the severity of symptoms. [Author's summary.]

4913. Legg, J. T., and Ormerod, P. J.
Yellow net—a virus disease of hop.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 105, bibl. 6, illus.

So far found only on a few plants of Fuggle and Bullion in 4 hop gardens, this disease is characterized by an interveinal chlorosis of the leaves, which is quite distinct from the symptoms caused by other hop virus diseases. It has been transmitted by grafting.

4914. Coley-Smith, J. R.
Testing hop varieties for resistance to downy mildew disease, *Pseudoperonospora humuli* (Miy. and Tak.) Wilson. I. Preliminary detached leaf and shoot tests.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 40-7, bibl. 3.

By using a standard concentration of sporangia (20,000/ml.) and a standard age of leaf, the field responses of 5 hop varieties to downy mildew infection were compared. The differences in sporing rates on the 5 varieties reflected the degree of resistance which had been observed under unsprayed conditions in the field. In a second method pot plants grown from 2-node cuttings had all shoots except 1 pinched out. The remaining shoot was cut back to 3 nodes above the soil surface when it had reached 50 cm. The lateral shoots were treated with a suspension of sporangia when they were 2·5 cm. long, incubated in a cold frame for 10–15 days and the percentage of shoots which became lateral spikes was measured. The results again reflected the apparent degree of field resistance of the varieties.

4915. Coley-Smith, J. R.
Overwintering of hop downy mildew, *Pseudoperonospora humuli* (Miy. and Tak.) Wilson.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 107-14, bibl. 5, illus.

An account is given of experiments which suggest that *Pseudoperonospora humuli* can overwinter, in infected hop rootstocks, in the form of mycelium, and that buds can be infected as a result of mycelium growing up into them *via* the cushion of tissue on which they are formed. The experiments also suggest that oospores, at least in the season following their formation, are of little or no importance in the formation of systemically infected shoots in spring. Suggestions are given for control of the basal spike form of downy mildew. [Author's summary.]

4916. Skotland, C. B.
Investigations on hop downy mildew and its influence on root die-out.
Modern Brew. Age, 1959, **59**(6): 47-8, from abstr. in *Wallerstein Lab. Commun.*, 1960, **23**: 223-4.

In the Yakima valley the fungus appeared to overwinter mainly in the infected crowns. Proper cultural methods are considered to be the best control. Treating the crowns with manganese ethylene bisdithiocarbamate or pentachloronitrobenzene was promising, and spraying the shoots, when 4–12 in. long, with streptomycin sulphate at 1,000 p.p.m. reduced the number of infected shoots by 63·70%.

4917. Christie, T. B. C.
The effect of fertiliser applications on the *Phytophthora* disease of hops.
A.R. Cawthron Inst., 1959-60, 1960, pp. 32-3.

Applications of organic material, with and without N fertilizer in various forms, had no effect on the number of plants which died per season.

4918. Sewell, G. W. F., and Wilson, J. F.
Machine picking in relation to progressive *Verticillium* wilt of the hop. I. A study of the infectivity of machine-picked hop waste.
A.R. E. Malling Res. Stat. 1960, 1961, **A44**: 100-4, bibl. 10.

Infection by the virulent, or progressive, strain of *V. albo-atrum* can occur without symptoms in both wilt-sensitive and wilt-tolerant varieties of hop. The harvesting of such symptomless infected plants for machine-picking involves the transport of infected material (often along public roads) to the machine, and the accumulation of very large quantities of infected hop-waste in its vicinity. The highly infective nature of this waste was demonstrated by a field experiment. Attention is drawn to the increased risks of spreading progressive wilt associated with the change from hand- to machine-picking, and measures to minimize these risks are recommended. [Authors' summary.]

4919. Hautke, P.
Vliv odřezávání rév na chmel. **(The effect of cutting down the bines on hops.)**
Chmelařství, 1960, **33**: 93-4, 108-9, and 124-5.

Several experiments are described which show that cutting down the bines for machine picking, i.e. before they have died back and the nutrients have passed to the roots, reduces the growth and yield of hops. To prevent this it is suggested that hop gardens should be divided into 3 parts and each year only ⅓ picked by machine. Cutting down the bines of young hop plants caused a 30% decrease in yield with a serious decline in further growth; hence it should not be practised until the plants are 3 to 4 years old. Cutting down should be carried out as high and as late as possible, and hops cut down at harvest should also be pruned first in the spring to give them the longest possible growing period.

4920. Bailey, P. H.
Hop drying in the 1950's—a review.
A.R. Wye Coll. Dep. Hop Res. 1959, 1960, pp. 120-8, bibl. 10.

4921. Fric, V., and Margaritopulos, V.
K výkonu pásové sušárny na farmě v Břežanech. **(The performance of the conveyor drier on the farm at Břežany.)**
Chmelařství, 1960, **33**: 174.

An improvement was obtained in the output of the Binder-Bürgmayer 3-band continuous hop drier in 1960 compared with 1959 [see *H.A.*, 31: 2839]. The average total time for drying a load was 6·30 hours with speeds of: 1st band, 12 cm./min. with a 17-cm. deep layer of hops; 2nd band, 8 cm./min. with a 22-cm. layer; and 3rd band, 5·5 cm./min. with a 35-cm. deep layer.

4922. de Backer, M. H.
Drying, storage and use of hops in brewing.
Brass. et Malt., Belg., 1960, **10**: 7-12, from abstr. in *J. Sci. Food Agric.*, 1961, **12**: i-143-4.

Losses of humulone and lupulone during drying were minimized by starting the drying with air at 30° C. and gradually increasing the temperature to 40°; no damage occurred at 60° provided that the moisture content had been reduced to approximately 10%. Re-drying of material that had absorbed moisture could be carried out at temperatures higher than 40° only if the moisture content did not exceed 18 to 20%. The most satisfactory storage temperature for fresh hops was —20 to —30° C.; moulds may develop on moist hops at —5° C.

Insecticidal plants.

(*See also* 3751, 5570.)

4923. Mendes, L. O. T.
Seleção e melhoramento do timbó. II. Estudo de uma população de 153 plantas de timbó macaquinho—*Derris nicou* (Benth.). **(Derris selection and breeding. II. A study of a population of derris, *Derris nicou*.)** [English summary ½ p.]
Bragantia, 1960, **19**: 273-305, bibl. 1.

A population of derris plants at Belem was found to consist of two groups of 82 and 71 plants each, with root contents of less than 5 and more than 9% rotenone, respectively. Mean data for the high-rotenone group were: root weight 1,011 g., moisture 5·31%, air-dried roots 949 g., ash 5·24%, total extracts 28·63%, rotenone 13·53% and degueline 10·09%. [For part I, see *H.A.*, 31: 1019.]

4924. Rao, K. B., and Rao, N. V. S.
Chemical components of the root bark of *Mundulea suberosa* Benth.
J. sci. industr. Res., India, 1958, **17B**: 384-5, bibl. 4.

Chemical and physical characteristics of 2 main compounds, only one of which is toxic to fish.

4925. West, T. F.
The history of the African pyrethrum industry.
J. roy. Soc. Arts, 1959, **107**: 423-39, illus.

Traced from the discovery of pyrethrum in the 1850's to the first African plantings in 1929 and thence to present-day production and developments.

4926. Church, B. M.
An investigation of sampling dried pyrethrum flowers from bulk.
Trop. Sci., 1960 (issued 1961), **2**: 200-18, bibl. 7.

A reference sampling method and a method of obtaining routine commercial samples are described in detail.

Rubber plants.

4927. Załęska, Z.
Niełupki *Taraxacum kok-saghyz* jako przykład zmienności owoców i nasion w rodzinie Compositae. **(Fruits of kok-saghyz as an example of the variability of fruits and seeds in the Compositae.)** [English summary 10 lines.]
Rolnictwo, 1957, No. 1, pp. 51-74, bibl. 10, illus.

A detailed morphological and biometrical study of fruit and seed characters.

Seed oils.

(*See also* 3724, 5362, 5580.)

4928. Gunstone, F. D., and Sykes, P. J.
Vegetable oils. IX. Application of reversed-phase chromatography to the analysis of seed oils.
J. Sci. Food Agric., 1961, **12**: 115-23, bibl. 39.

In oils from *Gmelina asiatica*, *Cephalocroton peuschelli*, *Vernonia camporum* and *Jatropha curcas*. [For earlier work, see *H.A.*, 30: 956.]

4929. Mackie, A., and Mieras, D. G.
Chemical investigation of seeds of selected tropical plants. I. Component acids of the fats or oils.
J. Sci. Food Agric., 1961, **12**: 202-5, bibl. 5.

In seeds of *Areca catechu*, *Monodora myristica*, *Xylopia aethiopica*, *Celosia argentea*, *Anogeissus schimperi*, *Mangifera indica* and *Carapa procera*.

4930. PAVY, T.
Castor beans in trial plantings.
J. Agric. W. Aust., 1961, **2**: 217-19, illus.

Early results at Bundidup Research Station, Wokalup, were promising. Yields ranged up to 3,226 lb./acre (var. Cimarron) and oil contents up to 58·8% of dry matter.

4931. JARRY, A.
Influence des conditions climatiques sur la sélection du ricin au Dahomey. (**The bearing of climatic conditions on castor bean selection in Dahomey.**)
Oléagineux, 1961, **16**: 167-72, bibl. 11, illus.

Six years' selection work by the I.R.H.O. is reviewed. The variety R 63, from Cambodia, has shown considerable promise.

4932. LEYKO, Z., AND PURZYCKA-WOLIŃSKA, J.
Badania nad wartością nasion rącznika (*Ricinus communis* L.) z upraw na terenie Polski w roku 1949. (**Investigations on the value of the seeds of the common castor oil plant from Polish crops in 1949.**) [English summary ¼ p.]
Rolnictwo, 1957, No. 2, pp. 65-74, bibl. 24.

Seeds from 32 plantations in southern and central Poland were analysed, and the results are tabulated. Investigations are continuing to find the most suitable regions for castor bean cultivation.

4933. PERUCCI, E.
Il trapianto del ricino. (**Transplanting castor beans.**)
Progr. agric., Bologna, 1960, **6**: 1399-1408, illus.

Sowing castor beans under glass, in brick "cells" filled with blocks of compost, produced plants with root systems modified from fragile tap roots to well developed fibrous systems, and favoured early branching of the stems and consequent early flowering. For transplanting, the roots in their compost blocks were easily removed from the open side of each "cell". This system of raising seedlings avoids the dangers of spring and autumn frosts to which direct sowing exposes the plants, and produces higher total and first quality seed yields.

4934. LEA, J. D.
Studies on the depth and rate of root penetration of some annual tropical crops.
Trop. Agriculture, Trin., 1961, **38**: 93-105, bibl. 9, illus.

Castor roots in a sandy loam soil extended through the full depth of the profile and entered underlying ironstone or weathered gneiss at 5–7 ft. Data are also provided on root development of several field crops.—Univ. Coll. Ghana.

4935. JAKOB, K. M.
Culture and staining of pollen grains of *Ricinus communis*.
Stain Tech., 1960, **35**: 297-304, bibl. 5, illus.

4936. MUKERJI, S. K., SHAHANI, M. N., AND PRASAD, L. K.
Cultural studies on sarguja (*Guizotia abyssinica*).
Sci. and Cult., 1961, **27**: 38-9.

Both the application of 20 lb. N and 20 lb. P_2O_5 per acre at sowing time and drilling the seed in rows instead of broadcasting gave significant yield increases in the years 1956–1960.—Ranchi agric. Coll.

4937. VISHIN, M. L.
A note on the fatty oil obtained from *Nigella damascena* seeds.
Curr. Sci., 1961, **30**: 55-6, bibl. 9.

Chemical and physical characteristics.

4938. MRÁZ, F.
Vliv škodlivého působení houby *Helminthosporium papaveris* Hennig na výnosy máku v kraji Karlovy Vary v letech 1957 a 1958. (**The influence of damage by the fungus *Helminthosporium papaveris* on the yield of poppies in the Karlovy Vary district in 1957 and 1958.**) [Russian and German summaries 1 p. each.]
Rostlinná Výroba, 1960, **6**: 1083-94, bibl. 9, illus.

The loss of seed caused by *H. papaveris* was found to depend on the degree of infection of the capsules, which in turn depended on the course of the weather, especially in July, when the capsules begin developing. High temperature and rainfall favour the fungus, and damage by *Ceutorrhynchus macula-alba* facilitates its entry. A seed drench of 50 g. Agronal (a mercury compound) per 50 kg. of seed is recommended.

4939. ČAKAR, L.
Prilog poznavanju makovog korenovog surlaša *Stenocarus* (*Coeliodes*) *fuliginosus* Marsh. (**A contribution to the knowledge of *Stenocarus fuliginosus*.**) [English summary 2 pp.]
Zašt. Bilja, 1960, No. 57/58, pp. 183-202, bibl. 10, illus.

A detailed description is given of the biology of this pest and of the damage it causes to oil-seed poppies in Macedonia. Control can be effected by improving the growing conditions of the crop and by chemical treatment, which should start at the end of February in the south and in the middle of March further north. In laboratory trials 100% control of the adults was obtained with all concentrations of several BHC and DDT formulations, Gamadin (20% BHC) having the most rapid action and Pepein-53 (7·4% a.i. of DDT plus lindane) the slowest.—Direction Plant Prot., Skopje.

4940. NUNN, W. M., AND OTHERS.
Kimberley Research Station—a progress report.
J. Agric. W. Aust., 1960, **1**: 1044-59, bibl. 11, illus.

Safflower (pp. 1052-3): Yields of 2,000–3,000 lb./acre, with an oil content of 30–35%, have been obtained in trials in recent years. To obtain high yields sowing must take place in May as soon as the rains cease, at a seed rate of up to 80 lb./acre, with close row spacing and applications of superphosphate. Regular spraying with endrin and DDT is also recommended.

4941. KLOSE, S. R.
Weed control in linseed and safflower.
Qd agric. J., 1961, **87**: 81.

2,4-DB at all rates tested proved phytotoxic to safflower, a crop already known to be susceptible to 2,4-D and MCPA.

4942. MCCAIN, A. H., AND OGAWA, J. M.
The control of seed-borne safflower rust by steam.
From abstr. in *Phytopathology*, 1961, **51**: 66.

Safflower seed may be exposed to steam for up to 4 seconds without adversely affecting germination. Seed heavily infested with teliospores of *Puccinia carthami* was dropped 4 times through a 1-ft. coil of perforated copper tubing under steam pressure, receiving a total exposure to steam of 1 second. The seed was then sown in moist steamed soil in boxes held at 5° C. for 1 week and then at 21–25° C. for 3 weeks in a greenhouse. No rust-infected plants appeared; untreated seed produced 17·4% rust-infected plants.

4943. EGOROVA, H. P.
***Ramularia carthami* L. on safflower.** [Russian.]
Zašč. Rast. Vred. Bolez., 1959, **4**(4): 34-5.

Controlled by 1% bordeaux.

4944. PAWLOWSKI, S. H.
Estimation of oil in safflower seed.
Nature, 1961, **189**: 772-3, bibl. 1.

In view of an unexpected negative correlation between oil percentage and bushel weight the physical and chemical properties of safflower seed were investigated, and it is suggested that the established relationship between low specific gravity and high oil content may be used in evaluating lines when selecting for oil content.—Canada Agric. Res. Stat., Lethbridge, Alberta.

Sugar maples.

4945. JONES, G. A.
We can increase sap yields.
Macdonald Fm J., 1961, **22**(2): 6-7, 13, illus.

Tap-holes were drilled in maple trees to a depth of 3 in. and plaster of Paris pellets, 2 in. long and impregnated with paraformaldehyde, were inserted. Sap flow was much greater than from holes in the same tree without the pellets. The micro-organism content of the sap from the treated holes was much lower than that from the untreated holes. It is thought that microbial growth in the tap-holes is the cause of premature reductions in sap flow. Paraformaldehyde cannot be approved for general use, however, owing to the toxicity of the formaldehyde found in the collected sap.

4946. ANON.
Pellets protect maple tapholes.
Agric. Res., Wash., 1961, **9**(8): 16.

The insertion of paraformaldehyde pellets in the tap-holes to control microbial growth resulted in sap which, on evaporation, gave syrup of a uniform high quality throughout the tapping season. The pellets do not contribute any residues to the syrup. [See also *H.A.*, 30: 967.]—Mich. agric. Exp. Stat., E. Lansing.

Sundry plants.

(*See also* 5549, 5555.)

4947. CAPRETTI, C.
Oidio di *Bixa orellana* L. in Venezuela: *Oidium bixae* Viegas. (***Oidium bixae*, the powdery mildew of *Bixa orellana* in Venezuela.**)
Riv. Agric. subtrop., 1961, **55**: 13-19, bibl. 7, illus.

Bixa orellana, the fruits of which produce a red dye used for food colouring, is attacked in Brazil and Venezuela by the fungus *Oidium bixae*, which in turn is parasitized by the fungus *Cicinnobolus cesatii*. Control measures have so far been limited to the application of finely powdered sulphur, and the good results obtained warrant the extension of this treatment.—Fac. Farm., Univ. Los Andes, Mérida, Venezuela.

4948. POATS, F. J.
Guar, a summer row crop for the southwest.
Econ. Bot., 1960, **14**: 241-6, illus.

Cyamopsis tetragonoloba, grown mainly as a vegetable gum producer.

4949. LAUMAS, K. R., AND SESHADRI, T. R.
Leucoanthocyanidin from tamarind seed testa.
J. sci. industr. Res., India, 1958, **17B**: 44-5, bibl. 2.

Data on gelation behaviour of 2 extracts of potential value for plastics production.

FLORICULTURE.

General.

(*See also* 3742, 3766, 4274, 4373, 5179, 5562, 5575, 5591.)

4950. Bigot, J.
Comment diminuer le coût de la main-d'oeuvre en culture florale. **(How to reduce labour costs in floriculture.)**
Rev. hort., Paris, 1961, **133**: 11-15, illus.

Aspects discussed include air conditioning, apparatus for applying liquid fertilizers, and mechanical methods of soil sterilization and of mixing soil composts.

4951. Nuffer, W. P.
Automation in the nursery.
Amer. Nurserym., 1961, **113**(2): 7-8, 89-91, illus.

This article discusses why automation on the nursery is desirable and the importance of specialization and standardization to make automation of value. The machinery and equipment used by the author, notably to fill and handle cans used for container-grown plants, are described briefly.

4952. Nelmes, W.
Seaside planting.
Park Administ., 1961, **26**: 29.

Trees and plants which are resistant to, or fairly tolerant of, salt sprays are listed.

4953. Sheehan, T. J.
Plant improvement with gamma radiation.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 130-1.

Rooted chrysanthemum cuttings and gladiolus corms were irradiated at dosages up to 33,000 r. Dosages above 7,500 r were lethal to 40–90% of the chrysanthemum cuttings; those treated with 4,000 to 7,500 r were not killed but failed to flower. The best working range was 2,000 to 3,900 r, since less than 10% of the plants died and many colour mutants developed. Cuttings have been taken of the mutants in the hope that the colours can be recovered and compared with existing varieties. In gladiolus corms treated with 33,000 r sprouting was not affected, but the leaves were small, leathery and wrinkled and only 12% of the plants flowered. As the dosage was decreased growth and flowering approached normal. A few florets were partially double. [See also *H.A.*, 31: 1072 and 3849.]

4954. Nesterenko, V. G.
Concerning the germination of seeds after storage under laboratory conditions. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 99-103, bibl. 3.

The germination of 51 species, mostly ornamental plants, was tested after storage for up to 6 years. It was found that, where storage had reduced the percentage germination, the period over which germination occurred was also prolonged; for instance, with seeds of *Campanula persicifolia* stored for 2, 3 or 4 years germination was completed in 14, 27 or 33 days, respectively. Other factors reducing viability were also found to prolong the period of germination.

4955. Heladze, V. C., and Matinjan, A. B.
Experiments on the pre-planting treatment of seeds with micro-elements. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 103-4.

Seeds of *Acacia dealbata*, *Trachycarpus excelsa* [=*T. fortunei*] and *Ophiopogon japonicus* soaked for 24 hours in solutions of 0·2% manganese sulphate, 0·1% boric acid or 0·2% zinc sulphate germinated better than seeds soaked in distilled water. Solutions containing 2 of the micro-elements usually gave further improvement, particularly with *Acacia*, where Zn + B treatment resulted in 100% germination in 60 days.

4956. Witmer, J.
A simplified way to root cuttings.
Minn. Hort., 1961, **89**(1): 7, illus.

In a small pocket of sand dibbled into the top of a compost-filled pot.

4957. Wells, J. S.
Plant hormones—a modern aid.
Amer. Nurserym., 1961, **113**(2): 12-13, 84-9, bibl. 3, illus.

The author discusses progress in the use of hormones in propagation by cuttings, providing examples from his own experience with woody ornamentals. He considers that the nurseryman should have several strengths and combinations of hormones and should test their efficiency on his particular plants.

4958. Szabó, L.
Szintetikus növekedésszabályozó anyagok alkalmazása dísznövények vegetatív szaporításában. **(The use of synthetic growth substances in the vegetative propagation of ornamental plants.)** [English and Russian summaries 10 lines each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 11-18, bibl. 6.

NAA dust was applied to cuttings in the following concentrations: carnations 1,000 p.p.m., *Ficus elastica* 2,000 p.p.m. and *Pelargonium grandiflorum* and *P. zonale* 500 p.p.m. In all cases the percentage of rooting was improved and the time taken to root reduced.

4959. Callmar, G., and others.
In- och omkrukningsarbeten. Undersökning utförd ären 1958-60. **(Potting up and potting on. Studies carried out during 1958-60.)**
Medd. Alnarpsinst. Trädgårdsavd. **33**, 1960, pp. 25, illus.

Work analyses were made during the potting of cyclamen, azalea and begonia plants, and times are given for potting up and potting on into various-sized pots. Preliminary studies comparing Jiffypots and clay pots indicate that, although transport was easier with Jiffypots, it took slightly longer to pot into them. In the final section the authors show how the time spent in potting can be reduced by employing an assistant.

4960. Mastalerz, J. W.
Gibberellic acid makes plants tall, spindly.
Science for the Farmer, 1959-60, **7**(3): 7, illus.

Three to six weekly spray applications of GA at concentrations up to 100 p.p.m. may result in marked increases in stem length in various plants, e.g. roses, dwarf dahlias, ivy and snapdragons. The overall effect may, however, be unsatisfactory. Thus, with Better Times roses, grown under glass, large increases in stem length were not accompanied by any corresponding increase in plant weight. Again, with snapdragons axillary shoots became elongated to give the whole plant a feathery appearance and the foliage became pale. GA may prove useful as a substitute for the cold treatment necessary to promote flower initiation in certain greenhouse crops. With azaleas, for example, 8 to 10 applications of GA at 1,000 p.p.m. will promote flower initiation at normal temperatures.

4961. Ries, S. K.
Practical weed control in the nursery.
Amer. Nurserym., 1961, **113**(8): 11, 128, illus.

General recommendations on the use of herbicides and fumigants from Michigan State University, East Lansing.

4962. Mücke, K.-H.
Die chemische Unkrautbekämpfung in holländischen Baumschulen. **(Chemical weed control in Dutch nurseries.)**
Gartenwelt, 1961, **61**: 8-10, bibl. 4.

Recommendations are given for the use of systemic and contact weed killers among ornamental trees and shrubs.

4963. Breves, J.
Die chemische Unkrautbekämpfung in Holsteiner Baumschulen. **(Chemical weed control in Holstein nurseries.)**
Gartenwelt, 1961, **61**: 44-5.

Recommendations are made for both seed- and plant-beds.

4964. Ministry of Agriculture, London.
Chemical weed control in flower crops.
Adv. Leafl. Minist. Agric., Lond. **481**, 1960, pp. 5.

Some of the recommendations are tentative.

4965. Harrison, A. D.
Weed control in flower and ornamental crops.
Rep. 1960 annu. Conf. Inst. Park Administ., Edinburgh, 1960, pp. 18-23.

Notes on the use of chemicals, soil sterilization, mulching and flame guns.

4966. Gast, A.
The use of triazine herbicides in horticulture, especially on flowers and ornamentals.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5.

Experiments with grafted roses and rose rootstocks indicated that simazine is an effective and safe herbicide for roses, although some differences in varietal response were noted. Gladioli varied greatly in their response to simazine, thus Aranjuez and Mansoer were injured by 1 lb./acre, whereas Joe Wagenar was practically unaffected by 5 lb./acre. Established delphiniums were resistant to simazine at 5 lb./acre, but some other herbaceous perennials tolerated only 1 or 2 lb./acre. Applications of simazine at 1 and 2 lb./acre in mid-May had no toxic effect on chrysanthemums planted out in July and retained excellent weed control. It was considered that owing to their short residual effect methyl-mercapto triazines may have greater potential value for horticultural crops than simazine or propazine.—From *Weed Abstr.*, **10**, No. 66.

4967. Società Italiana di Fitoiatria.
Atti del convegno sul teme: "La lotta contro le malattie e i parassiti delle piante da fiore ed ornamentali." Sanremo, 10-11-12 giugno 1960. **(Proceedings of the conference on the subject of control of diseases and pests in flowering and ornamental plants, held at Sanremo, 10-12 June, 1960.)** [Brief English summaries to some papers.]
Not. Mal. Piante, 1960, Nos. 53/54, pp. 360, bibls, illus.

The general papers (4 in number) cover plant protection of flower crops in Italy. Among the special subjects covered by separate papers are: control of rose mildew; nematode control; foliar nutrition for preventing and curing deficiency diseases; Phosdrin for insect control; bulb diseases; Vapam in flower crops [in French]; a primula mosaic; maneb and its action against *Uromyces caryophyllinus*; control of *Botrytis* and *Fusarium* in gladioli; weed control in tuberoses and gladioli; viruses and bacteria of orchids; the effects of soil conditions and soil sterilization on lethal infections of carnations; chromium toxicity in carnations; control of downy mildew of grape vines with zineb and other fungicides; and yellow mosaic and infectious chlorosis of roses.

4968. Sauthoff, W., and Kröber, H.
Über Pythium-Wurzelfäulen an einigen Warmhauspflanzen. **(A *Pythium* root-rot of several hothouse plants.)**
Gartenwelt, 1960, **60**: 417-19, illus.
Pythium splendens, causing a severe root rot of *Anthurium*, *Scindapsus*, *Aglaonema*, *Peperomia* and *Platycerium*, can be partially controlled by keeping the soil friable and the temperature as low as possible. Steam sterilization of the soil, 4–6 weeks before it is used, gives good control.—Inst. Mykol., Berlin-Dahlem.

4969. Johnson, G. V., and Smith, F. F.
Insects and related pests of house plants: how to control them.
Home Gdn Bull. U.S. Dep. Agric. **67**, 1960, pp. 16, illus.
Recognition of pests and the use of relatively safe insecticides and other control measures.

4970. Baur, R. O.
This is why we are using a new grading system.
Flor. Exch., 1961, **136**(10): 16-17, illus.
The Central [U.S.] States Research Group has developed a system of grading carnations, chrysanthemums and other flowers. Four grades have been established, with flower diameter and stem length as the main criteria. A grading board used to measure these characters is illustrated.

4971. Besemer, S. T.
Shipping methods used for fresh cut flowers evaluated in transcontinental trials.
Calif. Agric., 1961, **15**(3): 6-7, illus.
Column stocks. Turgidity was retained by re-cutting and crushing 2–3 inches of the cut ends of the stalks after shipment; the onset of decline was postponed for 24 hours by cooling the stocks for 24 hours after shipment, but the rate of decline was not affected; the quality of flowers packed in corrugated or styrene-type boxes was similar. *Carnations.* The life of flowers after arrival was increased by about 1 day, when the flowers had been cooled before shipment; re-cutting the stems after arrival increased flower life by about 2 days without the aid of other treatments, and for about 10 days when they were held in water at 42° F.; the life of re-cut carnations was halved when they were held at room temperature after cold storage. The recommended shipping measures are to cool the flowers overnight to 38°–42° F. in water containing a flower preservative and then to pack them in un-iced boxes. *Chrysanthemums.* Standard flowers in bud shipped well in a box with no ice; the buds opened to a saleable commercial stage in 4–5 days when their stems were re-cut and a flower preservative was added to the water.

4972. Fries, H. H.
Flower box insulation—wet or dry?
Flor. Exch., 1961, **136**(2): 19.
A table (based on research by A. Laurie and A. G. Hauge at Ohio State University) shows that with an outside temperature of 8·5° F. the temperature within flower boxes will take longer to reach freezing level when the newspaper insulation is moistened than when it is dry.

4973. Consumers' Association Ltd.
Cut flower preservatives.
Which?, 1961, February, pp. 46-8, illus.
The life of chrysanthemums, roses, carnations and anemones bought from a florist was compared in tap water and various solutions. The life of carnations in Chrysal and sugar solutions was increased by 2 or 3 days; bruising the stems of chrysanthemums increased life by about 1 day. Aspirin was harmful to anemones. The life of freshly-cut carnations was also prolonged by Chrysal, but sugar had little effect. Flora-Pura (hydrogen peroxide) had no beneficial effect on the life of carnations.

Annual and herbaceous plants.

(*See also* 3621, 3672, 3677, 3679, 3681, 3690, 3706, 3724, 3757, 4675, 4953, 5083, 5552, 5563, 5574, 5579, 5592.)

4974. Klein, A. O., and Hagen, C. W., Jr.
Anthocyanin production in detached petals of *Impatiens balsamina* L.
Plant Physiol., 1961, **36**: 1-9, bibl. 22.
Anthocyanin production in excised balsam petals was greater than normal when they were floated on a nutrient medium. Cyanidin, quercetin and peonidin appeared only in cultured petals of some of the genotypes used. Injury and the application of kinetin both accelerated petal expansion and anthocyanin production. Certain other growth substances tested had restrictive effects. [See also *H.A.*, 31: 2891.]—Indiana Univ., Bloomington.

4975. Wellensiek, S. J.
Flower formation in *Campanula medium*.
Meded. LandbHogesch. Wageningen, 1960, **60**(7): 1-18, bibl. 12, illus.
Campanula medium will initiate flowers after plant vernalization, usually followed by long days at high temperature, or after short-day treatment followed by long days, both at high temperature. Plants will not respond to vernalization for the first 4 or 5 months of growth; within certain limits the cold requirements become less as the plants age. During a prolonged period of cold treatment both juvenile and adult plants showed stem elongation, and in addition adult plants slowly became generative, although not to the point of completing flower buds. Old plants will also flower in short days

after prolonged vernalization. With plants in the juvenile phase the period needed for a short-day response is about one month; it can be completed in short days at high temperatures, but the effect is slower than when it is completed in long days. With mature plants age does not influence the period of short-day treatment needed. It is therefore concluded that with *Campanula medium* the mechanism of vernalization is completely different from that of short-day followed by long-day induction.—Lab. Tuinbouwpl., Wageningen.

4976. SALINGER, J. P.
Carnations for market and flower garden.
N.Z. J. Agric., 1961, **102**, 88-97, illus.
Glasshouse and outdoor culture, covering glasshouse construction, propagation, disbudding, spraying, calyx splitting, marketing, diseases and pests, and varieties.

4977. U.S. DEPARTMENT OF AGRICULTURE.
Research on carnation in the USDA.
Flor. Exch., 1961, **136**(6): 22-3, bibl. 13.
A review of work in progress on virus diseases, breeding for disease resistance, and genetical and cytological studies.

4978. ROBSON, J., AND FENN, P.
Distribution of phenyl mercuric chloride labelled with mercury-203, applied as a seed dressing, in the tissues of the young carnation plant.
Nature, 1961, **189**: 501-3, bibl. 7, illus.
The major concentration was in the cotyledons, hypocotyl and root adjacent to the hypocotyl. These organs became damaged owing to the strong affinity of PMC for the sulphydryl groups of protein. Experiments are described, however, in which PMC applied at 2 μg. per seed was an effective fungicide and did not damage the developing seedling. Amounts greater than 4 μg. per seed caused damage. Attention is drawn to similar phytotoxic effects of thiram used as a seed dressing.—Wantage Res. Lab.

4979. WHITE, J. W.
Carnation temperatures—a review.
Flor. Exch., 1961, **136**(6): 27-8, 87, bibl. 24.
Temperature requirements of growing plants.

4980. STEFFEN, L.
Zur Nährstoffversorgung in Nelkenkulturen. **(The supply of nutrients in carnation growing.)**
Gartenwelt, 1960, **60**: 463-4, bibl. 1.
Analyses of carnation soils in Schleswig Holstein showed that, in general, the pH values were satisfactory, but that contents of P_2O_5 were often above, and those of K_2O often below, their optimal levels.

4981. DE GROOTE, R.
Essai semi-industriel d'aquaculture de l'oeillet selon le système de circulation et avec un substratum de granit. **(A semi-commercial trial of growing carnations in water culture using the circulatory system and a granite substrate.)**
Rev. Agric., Brux., 1960, **13**: 1065-75, illus.
The construction of a commercial hydroponics installation is described. Carnations grown by this method had longer and stronger stems, and larger flowers of brighter colour which lasted longer, than those grown in soil.—Stat. Rech. Plant. ornement.

4982. BLAKE, J., AND HARRIS, G. P.
Effects of nitrogen nutrition on flowering in carnation.
Ann. Bot., Lond., 1960, **24**: 247-56, bibl. 17.
Two perpetual-flowering carnation varieties, Maytime and Puritan, were grown under glass in various conditions of N supply, day length and temperature. In short days, as compared with long, the number of leaves below the flower bud was always greater and the flower bud always appeared later. At low levels of N successive leaf pairs developed more slowly and more leaves were formed below the flower, so that flower initiation was delayed. This effect was more marked under short than under long days. The development of the flower bud from macroscopic appearance to anthesis was affected primarily by temperature. Low temperatures generally retarded development, this effect being most pronounced in N-deficient plants grown under short days. [From authors' abstract. For earlier work see *H.A.*, 26: 888.]—Univ. Reading.

4983. PESANTE, A.
Due tracheomicosi del garofano. **(Two tracheomycoses of carnations.)**
Inf. fitopat., 1960, **10**: 421-3, illus.
The fungus *Phialophora cinerescens* is soil-borne; thus tools and stakes which have been used in infected carnation beds or nurseries need disinfecting. Vapam has given promising results in disinfecting sandy soils. Among the crops alternated with carnations, 3 which have so far shown a capacity for reducing soil infection are anemones, artichokes and tomatoes. *Rhizoctonia solani* has been controlled by dusting with pentachloronitrobenzene at 60 g./sq. m., and in one instance soil fumigation with Vapam (100 g./10 l./sq. m.) eradicated a heavy infection. There are indications that green manuring may increase infection.

4984. STOFFERT, G.
Arbeitsgestaltung beim Nelkensortieren. **(Working conditions for carnation grading.)**
Gartenwelt, 1960, **60**: 457-9, illus.
An illustrated account is presented of an improved

lay-out of benches at which carnations are graded, together with a new type of seat and foot rest.

4985. Mastalerz, J. W.
Increasing the keeping life of carnations.
Flor. Exch., 1961, **136**(6): 26.

To obtain a maximum increase in the life of cut carnations the flowers should stand in a flower preservative solution for the whole of their life. Three preservatives [composition not stated] doubled the life of cut carnations when compared with tap water, although one of them was rather more effective than the other two.—Pa St. Univ.

4986. Carter, A. R.
Chrysanthemums in the smaller nursery.
Agriculture, Lond., 1961, **67**: 570-3.

Quick rooting of cuttings may be achieved in a mixture of equal parts of grit and peat under polythene covers or mist. Bottom heat and the use of a rooting compound also hasten rooting. Growing early flowering varieties under glass, pot growing and direct planting are discussed. Demeton-methyl, applied to the beds at the rate of 8 fl. oz./100 gal./50 sq. yd., is recommended for the control of aphids and red spider mites. Herbicides recommended include cresylic type sterilizers containing 40% of tar acids applied at 2½ gal./100 gal. when the chrysanthemum bases have become woody, 2,4-DES applied at 5 lb./acre 10–14 days after planting, and simazine and monuron, each applied at 2 lb./acre.—Luddington exp. Hort. Stat.

4987. Bullock, R. M., Clore, W. J., and Crandall, P. C.
New chrysanthemum varieties.
Stats Circ. Wash. St. agric. Exp. Stats **343**, 1958, pp. 3.

Short descriptions of 5 early, rain-resistant varieties bred at the Southwest Washington Experimental Station.

4988. Harris, L. J.
Chrysanthemums and heat therapy.
Gdnrs' Chron., 1961, **149**: 134-5.

Information on the heat therapy of young chrysanthemum mother plants and on culture (particularly manuring) after treatment.

4989. Boodley, J. W.
Single stem chrysanthemums in peat pots and peat and perlite mixtures.
Bull. N.Y. St. Flower Grs, 1961, No. 182, pp. 3-9, bibl. 1, illus.

A method of producing up to 4 crops of single-stem chrysanthemums per bench per year is described. The rooted cuttings are potted in peat pots and held on a nurse bed for 2½–3 weeks, and are then planted on benches by pressing the pots firmly into a growing medium consisting of soil, peat and perlite, to which superphosphate has been added. Data are presented on timing, plant fresh weight, stem length and flower size.

4990. Box, C. O.
Study use of tung hulls to replace peat.
Miss. Fm Res., 1960, **23**(6): 2.

A continuation of work reported earlier [*H.A.*, 29: 2724] has shown that the growth of pot chrysanthemums in a 1:1 compost of soil and tung hulls, previously soaked in a 6,000 p.p.m. ammonium nitrate solution for 24 hours, can equal that of plants grown in a 1:1 soil:peat moss compost.

4991. Box, C. O.
Chemical used to limit height of chrysanthemums.
Miss. Fm Res., 1960, **23**(11): 7, illus.

Height growth in the varieties Improved Indianapolis Yellow and Giant Betsy Ross was controlled by Amo-1618. Concentrations of 100, 250, 500 and 1,000 p.p.m. plus a spreader-sticker were used as a spray. A spray was given on the date of planting and repeated 3 times on alternate days. In another test rooted cuttings were soaked in 10, 25, 50 and 100 p.p.m. Amo-1618 solutions for 24 hours at 70° F. With both treatments the degree of control of height growth was proportional to the concentration of Amo-1618 used, but it varied with the two varieties. No injury was found at the highest concentrations, but, in general, flowering was retarded as the concentration was increased.

4992. Bonifacio, A.
La decapitazione del crisantemo. (**Crack-neck of chrysanthemums.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 484-90, bibl. 5, illus.

Pathological and physiological factors suggested by various authors as causes of cracking of chrysanthemum stems immediately below the flower heads are critically discussed. The defect is here attributed to the drastic disbudding of very luxuriant plants. In a test carried out on 3 groups of out-door plants those not disbudded, and those on which secondary crown buds were left, were unaffected, but leaving only the primary crown bud invariably led to cracking, of which microscopic details are shown. If the production of large, early heads from the primary crown buds is desired, the proportion of N in the fertilizer should be reduced and the application of P and K increased. Making vertical incisions across the primary crack may induce the formation of strengthening callus, but may equally admit infection, which would not be resisted by the over-succulent tissue concerned.

4993. Baker, K. F., and Davis, L. H.
***Ascochyta* disease of chrysanthemum appears in California.**
Reprint from *Calif. St. Flor. Ass. Mag.*, 1959, **8**(12): A-B, bibl. 2, illus.

The symptoms of a disease caused by *Ascochyta chrysanthemi* (*Mycosphaerella ligulicola*) are described. Control measures include spraying newly planted propagating beds with Parzate (2 lb./100 gal.) or Fermate (1 lb./100 gal.) every 10 days, and soil treatment with chloropicrin or steam between planting cycles.

4994. Hesling, J. J., and Wallace, H. R.
Susceptibility of varieties of chrysanthemum to infestation by *Aphelenchoides ritzema-bosi* (Schwartz).
Nematologica, 1960, **5**: 297-302, bibl. 6.

Marked differences in the susceptibility of mature chrysanthemum varieties to attack by *A. ritzema-bosi* were not related to stomatal size or frequency, density of epidermal hairs on leaves or stems, size of mesophyll air spaces or thickness of leaf-cell walls.—Rothamsted exp. Stat., Harpenden.

4995. Boodley, J. W.
Excessive captan causes injury.
Bull. N.Y. St. Flower Grs, 1960, No. 18, pp. 2-3, illus.

In answer to a grower's query it was discovered that high rates of application of dry captan to the soil as a substitute for steaming caused injury (resembling severe K deficiency) to newly-planted chrysanthemum cuttings. No injury is anticipated when captan is applied at 1 lb./100 gal. water to 400 sq. ft. of bench area.

4996. Procter, G. C.
Sistan treatment pays off with outdoor flowers.
Sistan doubles the crop of gladioli.
Grower, 1961, **55**: 723 and 765-6, illus.

Chrysanthemums and gladioli, grown in soil watered with Sistan (metham sodium=sodium N-methyl dithiocarbamate), produced more flowers of better quality than plants in untreated soil. The best results were obtained at rates of 2 pints in 25 gal. per 100 sq. ft. (110 gal. Sistan/acre).—Plant Protection Ltd.

4997. Shozaki, T.
On some characters of artificially-induced polyploid flowers. I. [Japanese, with English summary ¾ p.]
Agric. Bull. Saga Univ., 1960, No. 11, pp. 153-62, bibl. 21, illus.

Tetraploid and diploid cornflower (*Centaurea cyanus*) and sweet-sultan (*C. moschata*) plants were grown in pots containing soils of different pH. No difference in the growth of the cornflower plants was noticed in the range pH 5·5 to 7·0, but from pH 5·0 to 4·0 the 4n seedlings grew more vigorously. Tetraploid sweet-sultan seedlings were much inferior to the 2n seedlings under the same soil conditions (pH 5·0–4·0). Observations on the morphology of the root systems and on the intensity of root respiration are also reported.

4998. Samata, Y.
Genetic studies on *Cosmos bipinnatus*. Part I. On the classification and inheritance of flower types. Part II. Further studies on the inheritance of flower types.
Jap. J. Breed., 1958, **8**: 131-6; 1959, **8**: 261-8, from *Rec. Res. Fac. Agric. Univ. Tokyo, 1958-59*, 1960, No. 9, Abstr. 15.

Both papers discuss the genetics of single, double and variant flower types, with suggestions as to the respective genotypes involved.

4999. Cairncross, G. T. (Editor.)
The delphinium year book 1961.
Delphinium Society, London, 1960, 8½×5½ in., pp. 140, illus., 10s. or $1.75.

The main themes of this yearbook are the experiences of delphinium growers in various parts of the world, floral arrangement of delphiniums and breeding. Other articles of interest are: Annual delphiniums, by A. Barber; Recent progress in breeding red and yellow delphiniums, by R. A. H. Legro; and Root and crown rot in perennial delphinium, by D. E. Green.

5000. Legro, R. A. H.
Species hybrids in *Delphinium*. [Dutch summary ½ p.]
Euphytica, 1961, **10**: 1-23, bibl. 21, illus.

The barrier to crossing the red and yellow flowering species with cultivars of *D. elatum* is shown to be due in the first instance to differences in chromosome number between diploid and tetraploid cultivars and can be partly overcome by making diploid parents tetraploid by means of colchicine. It has also been shown that hybridization of red-flowering *D. cardinale* tetra and *D. nudicaule* tetra with *D. elatum* cv. offers few prospects for *Delphinium* breeding; however, the species hybrid *D. nudicaule* × *cardinale* tetra (as female) is more promising. In the latter case of these three-fold species crosses fertile progenies have been obtained producing the desired combinations orange and "red" combined with large and semi-double flowers. Although nothing can be said as yet of the hybrids of *D. elatum* cv. and the yellow flowering *D. zalil* tetra, produced in 1960, the introduction of the yellow flower colour via crosses with *D. zalil* × *cardinale* tetra is not possible on account of sterility of the F_1. Apart from two-fold species hybrids, attempts to obtain three-fold and four-fold species crosses along mutually different lines have also been successful. [From author's abstract.]—Landbouwhogeschool, Wageningen.

5001. Ignat'eva, I. P.
Some characteristics in the development of the delphinium. [Russian.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 4, pp. 43-55, illus.

The average life span of delphiniums was found to be 4 years, though divided plants may last for 5–7 years. The stages of development and morphology of the replacement shoots are fully described and illustrated. Flowering intensity increased to such an extent in the fourth year that further flowering was inhibited in that part of the plant. [For earlier studies on delphinium growth, see *H.A.*, 28: 2880.]

5002. Boodley, J. W.
Production of geraniums.
Bull. N.Y. St. Flower Grs, 1961, No. 181, pp. 1-3, illus.

Growing pot plants for sale, including fertilizing, propagation and the use of gibberellin to increase flower size and life.

5003. Nelson, P. E.
Geranium disease.
Bull. N.Y. St. Flower Grs, 1961, No. 181, pp. 1, 4-5, bibl. 3, illus.

The chief problems are bacterial stem rot and leaf spot (*Xanthomonas pelargonii*) and *Botrytis* blight. The control of these and several other diseases is discussed.

5004. Western Australia Department of Agriculture, Plant Pathology Branch.
Geranium rust.
J. Agric. W. Aust., 1960, **1**: 987-8, illus.

Symptoms and spread of *Puccinia pelargonii-zonalis* and its control using colloidal sulphur or zineb.

5005. Pag, H.
Die *Verticillium*-Welkekrankheit der *Gerbera jamesonii.* (***Verticillium* wilt of *Gerbera jamesonii.***)
Gartenwelt, 1961, **61**: 57-8, bibl. 13, illus.

It was demonstrated that wilt disease of gerberas could be caused by *Verticillium albo-atrum* as well as by *Phytophthora cryptogea*. Steam sterilization of the soil is recommended as a preventive measure. [See also *H.A.*, 30: 4162.]—Biol. Bundesanst., Lab. ZierpflKrankh., Berlin-Dahlem.

5006. von Hentig, W.-U.
Die Anwendung von Gibberellin bei *Sinningia speciosa.* (**The use of GA on *Sinningia speciosa.***)
Gartenwelt, 1960, **60**: 460-2, bibl. 2, illus.

Flowering of gloxinias was advanced by 6–10 days by spraying with the GA preparation Gibboe. The plants should be sprayed when the upper 4–8 flower buds reach a diameter of 1–1·5 cm., and 2 sprays are best applied 4–6 days apart. It is essential to maintain a relatively low temperature, 18–20° C., throughout the time from the application of the spray until the plants are marketed.

5007. Lingaraj, D. S.
Propagation of *Althaea rosea*, Benth. and Hook. (hollyhock) by air layering with the aid of growth regulators.
Curr. Sci., 1960, **29**: 488, illus.

Side shoots of 2–3-month-old plants were treated either with IBA or NAA at 4,000, 3,000, and 2,000 p.p.m. or with IBA (1 mg.) plus NAA (1 mg.) combined with active carbon powder (1 g.). All the treatments induced rooting, but the lower concentrations were the most effective, roots appearing 14 days after treatment.

5008. Kaplan, L.
Historical and ethnobotanical aspects of domestication in *Tagetes*.
Econ. Bot., 1960, **14**: 200-2, bibl. 7.

Early history in Central America.

5009. Berney, M.
Quelles sont les meilleures variétés de *Tagetes patula*? (**Which are the best varieties of *Tagetes patula*?**)
Rev. hort. Suisse, 1961, **34**: 53-4.

Flower colour and shape, height, duration of flowering and culture of several varieties discussed.

5010. Činnov, E. A.
Control measures against grey mould of peony. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(6): 36.

Grey mould [*Botrytis cinerea*] on peonies is especially severe during wet and cool summers. Application of K and P fertilizers and regular watering of the plants makes them more resistant to the fungus. To prevent infection plants should be sprayed every 7–10 days in the spring up to the end of flowering with 1% bordeaux mixture, and the soil round the plants should be dusted with DDT against ants, the carriers of the fungal conidia. Diseased plant debris should be destroyed immediately. Good control was obtained by cutting the stems and the leaves down to soil level in October and covering each stool with humus mixed with 500 g. bone meal, 300 g. wood ash and 20 g. BHC.

5011. Mokrá, V.
Příspěvek k identifikaci virové nekrózy zjištěné na *Primula obconica* Hance v Ceskoslovensku. (**A contribution to the identification of virus necrosis of *Primula obconica* in Czechoslovakia.**) [Russian, German and English summaries ¾ p. each.]
Rostlinná Výroba, 1960, **6**: 1175-90, bibl. 39, illus.

The symptoms, incubation period and characteristics of the virus, which appears to be a strain of the tobacco necrosis virus.

5012. Salimei, F. S.
La violetta africana. **(African violets.)**
Ital. agric., 1961, **98**: 295-8, illus.

General care and propagation as house plants.

5013. Pape, H.
Eine bisher nicht beschriebene Blutenmissbildung des Usambaraveilchens (*Saintpaulia ionantha* Wendl.). **(A hitherto undescribed floral abnormality of saintpaulias.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1961, **13**: 30-1, illus.

Petals were wholly or partially replaced by stamens, and leaf cuttings from the plants with abnormal flowers themselves produced abnormal flowers.

5014. Crawford, R. M. M.
Respiration and glucose metabolism in the apical bud in relation to photoperiodism in *Salvia splendens*.
Physiol. Plant., 1960, **13**: 755-60, bibl. 8.

An examination was made of the respiratory activities of excised buds of *Salvia splendens* at the time when they first began to react to the effect of day length and up to the node preceding the last vegetative node formed before flowering. In the first node buds the oxygen consumption and the carbon dioxide evolution were higher in 16- than in 8-hour days. Oxygen uptake fell from the first to the fifth node in long days by a significant amount. At the same time little change was seen in the corresponding activities in the short day buds. The respiratory quotient rose by a significant amount for long day buds with the maturation of the plants. Glucose feeding experiments carried out on the first node buds showed that the labelling pattern of the incorporated C^{14} was the same in long and short days. On increasing the amount of glucose given to the buds by a factor of 10 the corresponding rise in the radioactivity of the extracts made from the buds was greater in short than in long days. This was taken as evidence of a larger pool size of metabolites in long day buds. In spite of the increased respiratory activity of the buds exposed to an inductive day length, no difference was found in the labelling pattern of the assimilatory products obtained after feeding with C^{14}-labelled glucose. [Author's summary. See also *H.A.*, 31: 2915.]—Sonning, West Kilbride, Ayrshire.

5015. Shuel, R. W.
The influence of calcium and magnesium supply on nectar production in red clover and snapdragon.
Canad. J. Plant Sci., 1961, **41**: 50-8, bibl. 14.

Plants were grown in sand irrigated daily with 3 levels of Ca and Mg. In one snapdragon (*Antirrhinum majus*) crop a combination of high Ca and high Mg gave the best flower production and total growth and also the best nectar yield. In another crop the lowest Ca level, sub-optimal for growth, produced most nectar. The effects of nutrition on secretion were not related to the influence of pH, which was constant, or to the Ca, Mg, N, P or K contents of the shoots. [From author's abstract. For similar work with N, P and K, see *H.A.*, 27: 3748.]—Ont. agric. Coll., Guelph.

5016. Harborne, J. B., and Corner, J. J.
The cinnamic esters of *Antirrhinum majus* flowers.
Arch. Biochem. Biophys., 1961, **92**: 192-3, bibl. 9.

Glucose esters of *p*-coumaric, caffeic and ferulic acids.

5017. Plempel, M., and Seyffert, W.
Über den Nachweis von Zimtsäuren aus acylierten Anthocyanen der Levkoje, *Matthiola incana* R. Br. **(The demonstration of cinnamic acid from acylated anthocyanins in the stock, *Matthiola incana*.)**
Naturwissenschaften, 1961, **48**: 163, bibl. 3.

Much of the anthocyanin present was in the acylated form, with which cinnamic acid esters were associated.

5018. Hess, D.
Ribosenucleinsäure und Blühinduktion. **(Ribonucleic acid and flower induction.)**
Planta, 1961, **56**: 229-32, bibl. 8.

Experiments are described on flower induction in *Streptocarpus*, and its relation to the "reproductive" and "vegetative" RNA systems, each of which operates under certain specific conditions.

5019. Tronchet, A.
L'acide gibberellique et la circumnutation provoquée des tiges de zinnia. **(Gibberellic acid and the circumnutation induced in zinnia stems.)**
Rev. hort., Paris, 1960, **132**: 2319-21, bibl. 11, illus.

Treatment of zinnia plants, growing at 23–25° C. under fluorescent lights, with GA (200 p.p.m.), applied to the terminal bud, resulted in elongation of the internodes 2–3 days after treatment and a reduction in leaf size. The lignification of the stem was reduced and a twining movement observed.—Inst. bot., Fac. Sci., Besançan.

Bulbs, tubers, etc.

(*See also* 3621, 3625, 3691, 3793, 4368, 4502, 4953, 4996, 5006, 5558, 5569, 5574, 5576, 5592.)

5020. Vannicola, M.
Il problema delle bulbose da fiore in Italia. **(The problem of ornamental bulb crops in Italy.)**
Inf. Ortofruttic., 1960, **1**: 221-3, illus.

Bulb growing in Italy and Holland compared.

5021. Sakai, A.
The frost hardiness of bulbs and tubers. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 233-8, bibl. 5, illus.

Frost hardiness of bulbs and corms depends on their stage of development and internal condition. Minimum temperatures at which bulbs and corms of several species may survive after freezing for 24 hours in the winter are listed. Gladiolus, freesia and anemone corms are not frost hardy and cannot be hardened by artificial chilling. Anemone corms and ranunculus tubers with a water content of less than 25% grew after treatment in liquid N (—196° C.) for 24 hours, but after absorbing water they were damaged at —5° C.

5022. Langedijk, G., and Veerman, J. A.
Mechanisatie in de bloembollenteelt. **(Mechanization in bulb growing.)**
Weekbl. BloembollCult., 1960, **71**: 530-1, 534, illus.

Notes on new developments in machinery for planting, lifting, cleaning, sorting and storing bulbs.

5023. Anon.
New hot water treatment plant for bulbs.
Grower, 1961, **55**: 771-2, illus.

An electrically heated tank with forced water circulation, available in 2 sizes holding 6–7 cwt. and 12–14 cwt. of bulbs, respectively.

5024. Anon.
A machine for the smaller grower.
Grower, 1961, **55**: 482, illus.

The Lincoln single-row bulb planter is described, which has planted tulips and daffodils satisfactorily.

5025. Jeff, A. E.
Observation studies on the use of residual herbicides on anemones during 1958-59 and 1959-60.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 6.

In 1958, which was a wet season, 5 herbicides were applied, at various rates, 6 days after planting anemone corms. Simazine and monuron gave the best weed control and at 0·5 lb. and 1 lb. per acre, respectively, resulted in the highest yield of marketable flowers [see also *H.A.*, 31: 2924]. Among herbicides applied 10 days after planting in the very dry season of 1959 the best residual weed control was given by chlorpropham at 0·5 + fenuron at 1 lb. per acre and by monuron at 1 lb. per acre.—Rosewarne exp. Hort. Stat., Cornwall. —From *Weed Abstr.*, **10**, No. 67.

5026. Höster, H.-R., and Zimmermann, W.
Die Entwicklung des Leitbündelsystems im Keimblatt von *Pulsatilla vulgaris* mit besonderer Berücksichtigung der Protoxylem-Differenzierung. **(The development of the vascular system in the cotyledon of *Pulsatilla vulgaris*, with special reference to the differentiation of the protoxylem.)**
Planta, 1961, **56**: 71-96, bibl. 36, illus.

5027. Esashi, Y., and Nagao, M.
Studies on the formation and sprouting of aerial tubers in *Begonia evansiana* Andr. II. Effects of light and temperature on the sprouting of aerial tubers.
Sci. Reps Tohoku Univ., Ser. 4, Biol., 1959, **25**: 191-7, from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 21,970.

When isolated and exposed to continuous light while actively thickening aerial begonia tubers began to sprout, but after the completion of thickening the tubers sprouted no further in response to light. However, the thickened tubers could be made to sprout by low-temperature treatments. Whether or not the tubers sprouted, they developed roots.

5028. Nagao, M., and Mitsui, E.
Studies on the formation and sprouting of aerial tubers in *Begonia evansiana* Andr. III. Effect of gibberellin on the dormancy of aerial tubers.
Sci. Reps Tohoku Univ., Ser. 4, Biol., 1959, **25**: 199-205, from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 21,982.

GA at 0·1 to 100 p.p.m. had no dormancy breaking effect, and 10 and 100 p.p.m. GA inhibited the sprouting of aerial tubers. The effect of GA was greater in the more dormant tubers, and GA seemed to induce or prolong the dormancy. Like natural dormancy, GA-induced dormancy could be broken by low-temperature treatments. Rooting of aerial tubers was only slightly affected by GA.

5029. Jürgensmeier, H.-L.
Über das Zusammenwirken verschiedener Faktoren bei der Anthocyanentfärbung von Begonien. **(The co-operation of different factors in the decolorization of anthocyanin in begonias.)**
Planta, 1961, **56**: 233-6, bibl. 10.

Evidence is presented that the oxalic acid oxidase-peroxidase system, which can effect the decolorization of anthocyanin *in vitro*, functions similarly in the plant. The change in ascorbic acid content and anthocyanin content was found to follow a parallel course in the leaves.

5030. JÜRGENSMEIER, H.-L., AND BOPP, M.
Enzymatischer Anthocyanabbau bei Begonien. **(Enzymatic breakdown of anthocyanin in begonias.)**
Naturwissenschaften, 1961, **48**: 80-1, bibl. 12.

The enzyme system which decolourizes red anthocyanin in begonia leaves was found to possess water soluble and glycerine soluble fractions. The water soluble fraction is a peroxidase system. The glycerine extract is either oxalodehydrogenase or, more likely, oxalic acid oxidase. Measurements were made of the rate of decolourization of anthocyanin by extracts from different *Begonia* spp. and under different pH conditions.—Bot. Inst., Univ. Freiburg i. Br.

5031. ZANGHERI, S.
Osservazioni sulla *Pegomyia bicolor* Wied., con note sulla morfologia larvale die altre specie del gen. *Pegomyia* Rob.-Desv. **(Observations on *Pegomyia bicolor* with notes on the larval morphology of other species of the genus *Pegomyia*.)**
Boll. Zool. agr. Bachic. Serie II, 1957-58, **1**: 151-76, from abstr. in *Z. PflKrankh.*, 1961, **68**: 55-6.

The muscid *Pegomyia bicolor* was found attacking begonias in Italy. It can produce 4 generations in a season. Larval development takes 15–20 days and pupation occurs in the soil. The larvae mine in the leaves. Chemical control is recommended with nicotine or phosphoric acid esters.

5032. TOMLINSON, P. B.
The anatomy of *Canna*.
J. Linn. Soc. (*Bot.*), 1961, **56**: 467-73, bibl. 11, illus.

5033. WEGNER, I.-G.
Über den Einfluss einiger Faktoren auf den Cyclamensamenertrag. **(On the influence of several factors on cyclamen seed yields.)** [English and Russian summaries ½ p. each.]
Arch. Gartenb., 1960, **8**: 497-537, bibl. 51.

Experiments with the variety Dunkellachs showed that the amount of pollen produced did not depend on the weather at the time of sampling. Pollination in January, February and March resulted in fewer decayed capsules, higher seed yields and weights and a shorter time to maturity than did pollinations made in November and December. An interval of 7 days between successive pollinations gave the best capsule yields without affecting the number of seeds per capsule.—Humboldt Univ., Berlin.

5034. VANNICOLA, M.
La dalia. **(The dahlia.)**
Ital. agric., 1960, **97**: 995-1002, bibl. 1, illus.

Brief notes on types and varieties with coloured illustrations.

5035. AOBA, T., WATANABE, S., AND SAITO, C.
Studies on tuberous root formation in dahlia. I. Periods of tuberous root formation in dahlia. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 247-52, bibl. 6, illus.

Successive batches of dahlia seedlings, planted on 5 June, were dug out every 10 days until November to observe their root development. Plants grown from tubers were also observed. Adventitious roots appeared from early June to early August. The diameters of the adventitious roots increased gradually until in October they developed into tubers; these were of a similar anatomical structure to the adventitious roots but were unlike normal fibrous roots. The effect of reducing photosynthesis on the development of adventitious roots was investigated by defoliating plants every 10 days from late June to September. Early defoliation reduced the root development but late defoliation had little effect. A shade treatment applied in October reduced root diameter. Short-day treatment (8 hours for 20 or 40 days) reduced the number of roots but increased root diameters, whereas long-day treatment (24 hours) gave results similar to those obtained with natural day lengths.

5036. YASUDA, I., AND YOKOYAMA, N.
Effects of the day length on the flowering of dahlia. II. The difference of flowering among varieties of different strains. [Japanese, with English summary ⅓ p.]
J. hort. Ass. Japan, 1960, **29**: 228-32, bibl. 5.

The varieties Music, Ginban, Shirogane and Vaccus were grown under long-, natural- and short-day conditions. Artificial illumination for long-day treatments was provided by an incandescent lamp (100 watt/6 sq. m.) and short-day plants were covered with black plastic film from 5 p.m. to 9 a.m. With all varieties the plants subjected to short-day treatments produced the highest percentage of flowers, and treatments in which natural day lengths were followed by long days or in which long days were provided throughout the experiment resulted in little or no flower bud formation. [For part I, see *H.A.*, 30: 1018.]

5037. VAN DE NES, A. G. A.
De teeltresultaten bij knolfreesia's. De invloed van herkomst, temperatuurbehandeling en bewaring. **(Growing freesias. The effect of origin, temperature treatment and storage.)**
Weekbl. BloembollCult., 1961, **71**: 584-5, illus.

With particular reference to the need for healthy, vigorous stock and storage temperatures.

5038. Isaev, S. I., Drjagina, I. V., and Veršinkina, I. M.

The effect of prolonged irradiation with Co^{60} on the growth and cormel production of gladioli. [Russian.]

Doklady Akad. Nauk SSSR, 1960, **135**: 1250-3, bibl. 2.

Gladiolus cormels, 5–7 mm. in diameter, were planted in rows from 2 to 30 m. distant from a source of cobalt. Over a 4-month growth period the cormels nearest to the source received a total dosage of 28,301 r, those 30 m. away 346 r and the controls, 200 m. from the source, 4·6 r. Sprouting was scarcely affected by irradiation owing to the low dosages received at that stage (0·17 to 13·5 r per hour), but the number of leaves, the height of the plants and the number of newly formed cormels were reduced. These reductions were the greatest from the lowest dosages and smallest from the medium dosages. The size of the new cormels was reduced to a similar extent by all the dosages. Photosynthetic activity in the irradiated plants was slightly higher than in the controls.

5039. Apte, S. S.

A new approach to an old problem—early flowering of gladiolus.

Reprint from *Gladiolus, Yearb. New Eng. Glad. Soc.*, 1960, pp. 123-30, bibl. 8.

The author discusses some of the factors (temperature, variety, etc.) which govern the ease with which a grower can get gladioli to flower in June, with particular reference to experimental work in Holland.

5040. Hall, B. J.

Weed control in gladiolus.

Proc. 2nd Aust. Weeds Conf., 1960, Pap. 21, pp. 7.

Results are given of pre-emergence trials with several herbicides, as a result of which monuron at 3 lb./acre is recommended, provided the corms are planted deeply. In plots treated with dinoseb no signs of nematodes could be found, whereas in adjoining plots infestation in the form of root galls was apparent.—Hawkesbury agric. Coll., Richmond, N.S.W.—From *Weed Abstr.*, **10**, No. 257.

5041. Forsberg, J. L.

A summary of 1960 gladiolus disease control tests in Illinois.

Ill. St. Flor. Ass. Bull., 1961, No. 212, pp. 1-5, illus.

Pre-planting corm treatments with Emmi, Ceresan 200, Elcide 73, Ortho LM Seed Protectant, Chipcote 25 and Hercules 3944 gave equally good control of *Fusarium* and *Curvularia* rots. Terraclor, Upjohn U-2069 and Hercules 3944 showed promise as soil fungicides for the control of *Stromatinia*. [For earlier work, see *H.A.*, 30: 5862.]

5042. Magie, R. O.

Control of gladiolus corm diseases.

A.R. Fla agric. Exp. Stats, 1958-59, p. 304.

New fungicides were tested as 15-min. pre-planting corm dips against *Fusarium* and *Curvularia* infection, and the best treatments in terms of flower and corm production were Elcide 73 at 2 pt./100 gal. and Ceresan M at 1 lb./100 gal. Treatments with Panodrench 4, Ceresan M, Dowicide B, N.I. Ceresan, Emmi and Elcide 73 induced high cormel production. Some of the compounds delayed flowering. [For earlier work, see *H.A.*, 30: 4201.]

5043. Procenko, E. P., and Čelyškina, B. A.

Yellowing of gladioli infected with *Sclerotinia gladioli* (Mass.) Dray. [Russian.]

Bjull. glav. bot. Sada, 1960, No. 36, pp. 95-8, bibl. 4, illus.

Soil infected with the pathogen could be disinfected by heat treatment, but formalin and Granosan were not effective. The disease may cause serious losses and planting on infected soil should be avoided.

5044. Morris, C. J., and others.

Isolation of beta-alanine from *Iris tingitana* (var. Wedgewood).

Nature, 1961, **190**: 718-19, bibl. 6.

Obtained from the bulbs.

5045. Evans, W. R., Chi Shiun Tsai, and Axelrod, B.

Origin of β-amino*iso*butyric acid in iris.

Nature, 1961, **190**: 809, bibl. 6.

Chromatographic evidence on biosynthetic pathway.

5046. Čugunin, J. V.

A compound for the disinfestation of flower crops. [Russian.]

Zašč. Rast. Vred. Bolez., 1960, **5**(2) 37-8.

In 1956-58 great damage to lilies and hyacinths caused by mites, onion fly [*Delia antiqua*] and the thread millepede [*Julus terrestris*] led to tests with 0·3% Mercaptophos. Flower bulbs were immersed for 15 minutes in a 30% solution of 0·3% Mercaptophos and were then artificially infested with the pests. The bulbs were attacked, but within 5 hours all the insects were dead. The pests were also controlled on growing plants by applying a solution of Mercaptophos to the soil at the rate of 2–3 l. per plant.

5047. Adamson, R. M.

Weed control practices in bulbs and ornamentals.

Res. Rep. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, pp. 14-15.

Includes the information that in British Columbia monuron at 2·5–3 lb./acre + chlorpropham at 4 lb./acre applied before weed emergence in the autumn is effective for broad-leaved weeds, grasses and volunteer cereals in Easter lilies, often giving weed-free conditions until bulb harvest the following July. In western Washington dinoseb (amine) at 4·5 lb./acre is recommended for autumn spraying, with chlorpropham at 4 lb./acre added where grasses or cereals are a problem.—Dep. Agric., Vernon, B.C.—*Weed Abstr.*, **9**, No. 1934.

5048. Andison, H.
Control of the narcissus bulb fly.
Publ. Canada Dep. Agric. Res. Branch **905**, 1961, pp. 7, illus.

Control of *Lampetia equestris* by cultural measures, field treatments at or after planting, and post-harvest treatment (hot-water treatment and methyl bromide fumigation).

5049. Cowan, W. T., and Breese, T. C.
CIPC/diuron mixtures for pre-emergence weed control in peas, beans and bulbs.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 5, bibl. 1.

In trials with spring-sown peas, broad beans and field beans (*Vicia faba*) pre-emergence treatments with a chlorpropham/diuron mixture (32 oz. technical chlorpropham + 8 oz. diuron per gal.), applied at 4 pints/100 gal./acre 48 hours after sowing, gave satisfactory weed control in most cases. With narcissus, daffodil, bulbous iris and tulip 2 applications, each of 1 gal. of the mixture in 100 gal. water, were made, the first immediately after planting on new beds or after late-summer cleaning on established beds, and the second as close to crop emergence as possible; consistently good weed control, without crop damage, was obtained. Similar rates were applied to gladiolus immediately after planting and again after emergence; weed control was excellent, though crop damage occurred in one case of late, post-emergence treatment.—Farm Prot. Ltd., England.—From *Weed Abstr.*, **10**, No. 16.

5050. Wood, J., Howick, S. J., and Turquand, E. D.
Trials of herbicides on narcissus and tulip beds.
Proc. 5th Brit. Weed Control Conf., 1960, pp. 6, bibl. 2.

In field trials during 2 years with narcissus and tulips, chlorpropham was used pre-emergence in early winter alone, in mixtures with fenuron or diuron, or following the application of PCP. Post-emergence treatments in late winter were also applied at different growth stages. No treatment was consistently satisfactory in both years. Chlorpropham, in general, gave good results and the addition of fenuron and diuron increased its effectiveness. The use of PCP as a pre-emergence contact herbicide was desirable to ensure that the seed-bed was clean before applying chlorpropham. Chlorpropham at 2 lb./acre applied to tulips before the leaves separated, when about 2 in. high, caused no crop damage. On observation plots diquat showed promise as a pre-emergence contact herbicide, but for post-emergence use neither simazine nor diuron gave adequate control of weeds when used at rates low enough to be non-toxic to the crop. [For earlier work see *H.A.*, 29: 3523.]—Kirton exp. Husb. Fm, Lincs.—*Weed Abstr.*, **10**, No. 69.

5051. Hoogeterp, P.
Chloor-IPC-schade bij tulpen. **(Chlorpropham damage to tulips.)**
Weekbl. BloembollCult., 1961, **71**: 572.

Applications in March and early April of chlorpropham to Krelage's Triumph in a sandy soil relatively low in humus were more harmful than later applications. Spraying the shoots when they were 10 cm. high resulted in the greatest reduction in flower stem length, and yields were reduced most after spraying on 14 or 21 March. However, chlor-propham application did not cause a similar yield reduction with Brilliant Star, nor was it so toxic on heavier soils or on soils containing more humus.—Proefst. BloembollCult., Lisse.

5052. Amaki, W., and Hagiya, K.
Studies on fertilizer supply to tulips. II. The differences in the growth of tulip bulbs caused by supplying different amounts of fertilizers in the preceding generation, during forcing and field culture. [Japanese, with English summary 1 p.]
J. hort. Ass. Japan, 1960, **29**: 239-46, bibl. 6.

William Pitt bulbs produced by plants that received different amounts of N, P and K fertilizers were treated for 30 days at 10–15° C. followed by 50 days at 0–3° C. and were then planted in a plastic film house. Relatively large applications of NPK fertilizers, especially N, to the previous generation resulted in earlier flowering and in increased plant height, leaf size, flower size and plant weight, but the total yield was reduced. Large (17-19 g.) and small (2·5–3·0 g.) bulbs were planted in the field and their growth observed. Similar effects were noted with the larger bulbs but not with the smaller bulbs. The dry matter content of harvested bulbs and bulb yields also increased with increased fertilizer applications to the preceding generation. [For part I, see *H.A.*, 31: 2963.]

Lawns and sports turf.

(*See also* 3621, 3632, 4581.)

5053. Kerényi, E., and Lászay, G.
Összehasonlító csíráztatási vizsgálatok különböző korú fűmagvakkal. **(Comparative germination trials with grass seeds of different ages.)** [Russian and German summaries 4 lines each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 157-60.

Seeds of 8 lawn grass species remained viable for approximately 5 years. The germination percentage was highest in 2-year-old seeds and growth was positively correlated with it.

5054. (Bredakis, V., and Steckel, J. E.)
Best for turf grass.
Flor. Exch., 1960, **135**(27): 15.

A note to the effect that natural organic sources proved the best N fertilizers for turf grasses in trials at Massachusetts University.

5055. (Roberts, E. C.)
New high nitrogen fertilizer for lawns.
Ia Fm Sci., 1961, **15**: 631, illus.

Ureaform, available as a 38% slow-release N fertilizer or as a N source in mixed fertilizers, may be applied at rates as high as 20 lb. actual N/1,000 sq. ft. without injuring the grass. The slowness of release of N is such that the quality of seedling turf is equal to that given by 2 lb. actual N from inorganic sources.

5056. Le Grand, F.
Iron chlorosis in Roselawn St. Augustine grass growing on muck soils of the Everglades.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 374-8, bibl. 6.

Experiments indicated that the P:Fe ratio in the leaves should be kept below 30 to prevent chlorosis. A foliar spray of 1·2 lb. Fe per acre in the form of a chelate effected a cure and also increased the Mg:K ratio.—Everglades Exp. Stat., Belle Glade, Fla.

5057. (Ahrens, J. F., and Olson, A. R.)
Find chemicals work in crabgrass control.
Flor. Exch., 1960, **135**(26): 19, 23.

Applications of Dacthal, Zytron or calcium arsenate as dry powders in late April or early May to experimental plots infested with crabgrass gave more than 95% control. Repeated applications may be necessary in plots where crabgrass seedlings have emerged. None of the herbicides tested was effective against crabgrass in a newly seeded lawn.—Conn. Exp. Stat., New Haven.

5058. Harris, H. H., Schuldt, P. H., and Limpel, L. E.
Dimethyl 2,3,5,6-tetrachloroterephthalate (DAC-893), a promising pre-emergence turf herbicide.
Proc. Joint Mtg 16th N. cent. and 10th west. Canad. Weed Control Conf., 1959, p. 48.

Results of trials indicated that for the control of *Digitaria* sp. in turf the optimum rate of DAC-893 was 10–12 lb./acre. In one trial this herbicide at 6–12 lb./acre gave better control than chlordane at 60 lb./acre, and in another its effect at 7·5 lb./acre was not impaired by the addition of chlordane at 10 lb./acre or 2,4-D at 2 lb./acre. Earlier work showed that DAC-893 has little, if any, effect on established bluegrass, but may cause some thinning of fescues. [See also *H.A.*, 30: 5236.]—Diamond Alkali Co., Painesville, Ohio.—From *Weed Abstr.*, **9**, No. 1935.

5059. Lukens, R. J., and Stoddard, E. M.
Diseases and other disorders of turf.
Circ. Conn. agric. Exp. Stat. **208**, 1959, pp. 11, illus.

Descriptions, with control measures, are given of 7 fungal diseases and 4 miscellaneous organisms attacking lawn grasses. Fungicides used and the diseases they control are listed, and methods of controlling turf weeds are also noted.

5060. Schread, J. C.
Insect pests of Connecticut lawns.
Circ. Conn. agric. Exp. Stat. **212**, 1960, pp. 10, illus.

Descriptions, followed by control recommendations, are given of 9 pests or groups of pests. In most cases chlordane, and in some instances DDT, have given the best control.

Foliage and succulent plants.

(*See also* 3621, 3676, 3719, 3773, 4968.)

5061. Kurtz, E. B., Jr., and Alcorn, S. M.
Some germination requirements of saguaro cactus seeds.
Cactus Succ. J., 1960, **32**(3): 72-4, from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 21,596.

Germination was stimulated by red and inhibited by far-red light; under alternating red and far-red the last type of light applied determined germination. Following a $\frac{1}{2}$-hour exposure to red light a 24-hour imbibition period gave the highest germination. Several exposures to red light produced better germination than one exposure. At constant temperatures germination was best between 68° and 86° F., and with fluctuating temperatures between 59° and 95°.

5062. Hooymans, J. J. M., and Karstens, W. K. H.
Anatomical changes in cladodes of *Phyllocactus* hybr. in relation to flowering.
Acta bot. neerl., 1960, **9**: 333-42, bibl. 9, illus.

5063. Plaisted, P. H.
The presence of sedoheptulose in *Coleus blumei* Benth.
Contr. Boyce Thompson Inst., 1961, **21**: 35-6, bibl. 7.

Confirmation that sedoheptulose is one of the predominant free sugars in this plant.

5064. Timell, T. E.
Polysaccharides from ferns (Filicineae).
Chem. Ind., Lond., 1961, No. 15, p. 474, bibl. 4.

Details are given of the analysis of petioles of *Osmunda cinnamonea*. Results agreed fairly closely with those of the petioles and rhizomes of other ferns. The main polysaccharides were cellulose, pectin, xylan and glucomannan.—McGill Univ., Montreal, Canada.

5065. Riehl, [G.]
Sansevieria "Laurentii", und Gemüsespargel durch Stecklinge zu vermehren. (***Sansevieria trifasciata laurentii* and asparagus propagated by cuttings.**)
Gartenwelt, 1960, **60**: 420-1, illus.

Leaf cuttings of sansevieria "*laurentii*" do not propagate true to type, even when rooted from the yellow margins of the leaf. The typical form can, however, be raised from rhizome cuttings. Root cuttings of asparagus that include a bud will do well if grown in sterile gravel at a relatively high temperature and light intensity, and with the soil moisture kept constant by sub-irrigation.

5066. Lona, F.
Con le gibberelline la stagione non conta. (**With gibberellins the season does not count.**)
Frutticoltura, 1961, **23**: 35-7, illus.

Plants of *Saxifraga crassifolia*, treated in September with a few drops of a gibberellin solution on the dormant flower buds, produced normal inflorescences within the month, instead of in the early spring.

Orchids.

(*See also* 4967.)

5067. Adams, H., and Anderson, E.
A conspectus of hybridization in the Orchidaceae.
Evolution, 1958, **12**: 512-18, bibl. 12, illus.

A review of intergeneric crossings.

5068. Sharma, A. K., and Chatterji, A. K.
The chromosome numbers of a few more orchid genera.
Curr. Sci., 1961, **30**: 75, bibl. 10, illus.

Cymbidium lowianum, *C. munronianum*, *Renanthera imschootiana*, *Arundina bambusaefolia* and *Coelogyne corymbosa*.

5069. Nakasone, H. Y.
Artificial induction of polyploidy in orchids by the use of colchicine.
Diss. Abstr., 1960, **21**: 1030, being *L.C. Card No. Mic.* 60-4660 of 96 pp.

Various colchicine treatments were applied to seeds and vegetative organs of *Vanda* and *Dendrobium* species and hybrids, but tetraploidy was induced only in cuttings and young shoots of *Vanda* Miss Joaquim. The basal ends of these had been immersed in aqueous colchicine at 0·5–1·5% for 2 to 6 days. Most of the induced tetraploids were chimaeral or mixoploid.—Univ. Hawaii.

5070. Poddubnaja-Arnol'di, V. A.
Polyembryony in orchids. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 56-61, bibl. 5, illus.

Different examples of polyembryony are described and illustrated. The examples are classified into 5 groups according to the location of the regeneration processes.

Roses.

(*See also* 3757, 3766, 4368.)

5071. Salmaso, W. P.
Costituzione di nuove varietà di rosa. (**The breeding of new rose varieties.**)
Sementi elette, 1960, **6**(6): 54-7, illus.

A general article, listing the principal dominant characters and discussing methods of breeding and selection.

5072. Buck, G. J.
Some notes on the use of *Rosa laxa* as a source of hardiness in rose breeding.
Ia St. J. Sci., 1960, **35**: 255-60, from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 21,969.

The most valuable characteristics of *R. laxa* are cold-hardiness, resistance to powdery mildew and adaptability to areas of high temperature and humidity and low summer rainfall.

5073. Durkin, D. J.
Studies of the effect of soil nitrogen on the development of bottom breaks and on the nitrogen fractions of the leaves, buds, and xylem sap in the Better Times rose.
Diss. Abstr., 1960, **21**: 719, being *L.C. Card No. Mic.* 60-4074 of 82 pp.

After various pruning treatments the most bottom breaks were produced by one-year-old plants given the lightest pruning (to 20 in.) and high N (250 p.p.m. at each watering). Analysis of axillary buds from older plants after extra-soft pinching showed that N accumulation was low until the 6th day after pinching, after which considerable increases in all the N fractions occurred. Analysis of the xylem sap showed considerable amounts of nitrate, ammonium, amine and amide N; aspartic acid, glutamine and asparagine were the main organic N constituents.—Ohio St. Univ.

5074. Challenger, S.
Black-spot of roses. A review of recent research work.
N.Z. Gdnr, 1960, **17**: 259-63.

With particular reference to chemical control.

5075. English, L. L.
Tests with new spray materials for control of the greenhouse spider mite.
Ill. St. Flor. Ass. Bull., 1961, No. 211, pp. 3-4.

Control of mites on Better Times roses by CP-

10502 [an experimental material] was almost as good as that by Chlorobenzilate. Bayer 30686 was another promising acaricide. Polytrap (a homogenized polybutylene spray) at 2 gal. 100 gal. also gave control comparable to that of other acaricides.—St. nat. Hist. Survey. Ill.

5076. HELLE, W., AND OUDSHOORN, W.
Multiresistentie van de bonespintmijt (*Tetranychus urticae*) in Aalsmeer. **(Multiresistance in *Tetranychus urticae* at Aalsmeer.)** [English summary 8 lines.]
Tijdschr. PlZiekt., 1961, **67**: 28-31, bibl. 2.

A population of mites from glasshouse roses resistant to both Kelthane and to Chlorobenzilate.

5077. STAÏKOV, V. M., AND ZOLOTOVITCH, G. D.
Sur les causes d'accroissement de l'huile essentielle dans les fleurs de la *Rosa damascena* Mill. conservées dans de l'eau. **(Causes of increase in the essential oil content of *Rosa damascena* petals kept in water.)** [Russian summary 6 lines.]
C.R. Acad. bulg. Sci., 1960, **13**: 725-8, bibl. 6.

In rose petals kept in water for 3 or more days the essential oil content on distillation increased by over 30%. This was found to be due to the presence in the petals of terpene glucosides, which, after appropriate hydrolysis, accounted for more than 40% of the total essential oil content.

Other trees and shrubs.

(*See also* 3621, 3623, 3627, 3629, 3635, 3725, 3728, 3752, 3776, 3917, 5554, 5582.)

5078. TARR, M.
Shade trees for Iowa.
Ia Fm Sci., 1960, **15**: 609-12, illus.

Species for highways, streets and gardens, with notes on their planting and care.

5079. LONGENECKER, G. W., AND ELLARSON, R.
Landscape plants that attract birds.
Circ. Wis. agric. Ext. Serv. **514**, revised 1960, pp. 10, bibl. 13, illus.

Listing many ornamental trees and shrubs, including various fruit-bearing species, that attract birds.

5080. CHALLENGER, S.
Difficulties in raising shrubs from seed.
Gdnrs' Chron., 1960, **148**: 144, illus.

Germination of seeds of winter-sweet (*Chimonanthus praecox*) was accelerated when the seed coats were chipped or removed before sowing. The seedling survival of *Fremontia californica, Banksia ericifolia, Protea mellifera* and *Dryandra formosa* was improved by delaying pricking out until the seedlings had reached at least the 2-leaf stage.—Lincoln Coll., N.Z.

5081. EVERETT, T. H.
Moving large trees the American way.
Gdnrs' Chron., 1961, **149**: 248-50, illus.

London plane trees with trunks 12-15 in. in diameter were moved half a mile successfully in October and November. Preliminary pruning removed about one third of the branches. The diameter of the root ball left undisturbed was about 10 times that of the trunk. A trench was mechanically dug round the ball which was then undercut by hand. A wide strip of burlap was placed around the sides of the ball. Various lacing techniques are described. Following lacing the ball was pulled on to a platform by a bulldozer and the platform slid to the planting site. After planting adequate water must be given.—N.Y. bot. Gdn.

5082. TKAČENKO, V. I.
The damage to trees and shrubs caused by a sharp drop in the temperature during the growing season. [Russian.]
Bjull. glav. bot. Sada, 1960, No. 36, pp. 43-6.

The type of damage suffered in Kirgizia by many species of trees and shrubs at the end of May, 1958, when temperatures dropped to −2 to −4° C., is classified into 5 groups. Of 750 species examined, including many ornamentals, 218 were damaged. Species from different regions of Asia, Europe and America were classified according to whether their young shoots, buds, foliage, flowers or fruit were damaged.

5083. MONK, R. W.
Growth and survival of some ornamental plants on salinized soils and substrates and the resistance of their protoplasm as related to salt tolerance.
Diss. Abstr., 1960, **21**: 1319, being *L.C. Card No. Mic.* 60-4585 of 69 pp.

Three of the 8 annual species tested survived the highest level of salt (180 me./l.); the species were kochia, petunia and portulaca. Six perennial species that tolerated 10,000 p.p.m. salt in field plots were black locust [*Robinia pseudacacia*], honey locust [*Gleditschia triacanthos*], Russian olive [*Elaeagnus angustifolia*] and two varieties of squaw bush [*Rhus triloba*]. Buffalo berry [*Shepherdia argentea*] and golden willow [*Salix vitellina*] survived 8,000 p.p.m., while eastern red cedar, douglas fir, ash and honeysuckle survived 6,000 p.p.m. Two methods were used to determine the resistance of a tissue to salt, and the TTC (2,3,5-triphenyltetrazolium chloride) method proved easier to use and interpret than the plasmolytic method. Plant analyses showed that plants grown in treated cultures had higher Na contents than control plants; Ca was also higher in all plants except tamarix. The rate of growth (as measured by bole diameter) of all plants, except tamarix, decreased as the salt level in the substrate increased. The growth rate of tamarix was not affected by increasing salt concentrations. [See also *H.A.*, 31: 1859.]—Utah St. Univ.

5084. (Schoeneweiss, D. F.)
Current diseases studied in Illinois.
Bull. Ill. St. Nurserym. Ass., reprinted in *Amer. Nurserym.*, 1961, **113**(2): 70, 72.

Gloeosporium on alpine currant (*Ribes alpinum*), which causes leaf spot and defoliation, may be controlled by 3 applications at 2–3-week intervals of Dyrene, ferbam, manzate, Phaltan or zineb. Cedar-apple rust [*Gymnosporangium juniperi-virginianae*] on junipers was controlled by Acti-dione at 50 p.p.m.; preventive control was obtained with sprays of ½ lb. ferbam plus 3 lb. sulphur applied 3 times at 3–4-week intervals starting from early July. Sycamore anthracnose [*Gnomonia veneta*] was effectively controlled by a spring application of mercury (Coromerc) when the buds were swelling.

5085. Ped'ko, S. T.
The effectiveness of aerosols for the control of pests on trees in towns. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(1): 24.

When an 8–10% aerosol of DDT was applied twice at night on trees in the streets and gardens of Kiev against the larvae of the lackey moth [*Malacosoma neustria*] the infestation was eradicated. The best period for treatment was the end of April and the beginning of May when the mass hatching of the larvae occurred. When 15 l./ha. was used, it gave 97% control of the older larvae of *M. neustria* and also of the larvae of the pierid butterfly [*Aporia crataegi*], the gypsy moth [*Porthetria dispar*] and the apple ermine moth [*Yponomeuta malinella*]. Bees did not suffer any ill effect from the spraying.

5086. Willan, R. G. M.
A note on the apparently successful control of the white aphis (*Orthezia insignis* Dougl.) by the coccinellid *Hyperaspis jocosa* Muls.
Nyasaland Fmr For., 1961, **5**(3): 2-3, bibl. 2.

Within 12 months of releasing the imported parasite white aphids were almost eliminated from tecoma hedges, spathodea and jacaranda trees and gardenia bushes.

5087. Schread, J. C.
The black vine weevil.
Circ. Conn. agric. Exp. Stat. **211**, 1960, pp. 4, bibl. 5, illus.

Brachyrhinus sulcatus attacks many plants, but seems to prefer *Taxus*, rhododendron and hemlock, especially in the nursery. The best control was obtained with either DDT or chlordane at 1 lb./100 gal. applied once or twice at the end of June as a drenching spray, thus combining foliage and soil treatments.

5088. Shay, J. R., and Mink, G. I.
The role of viruses in crab apple propagation.
Amer. Nurserym., 1961, **113**(6): 14, 48, 50.

Ornamental crab apple species and varieties that are sensitive in some degree to chlorotic leaf spot are listed. This virus is frequently present in dwarfing Malling rootstocks, with no visible symptoms. Domestic apple seedlings, which are not sensitive to the virus, may be used as sources of vigorous rootstocks.—Purdue Univ., Lafayette.

5089. Wyman, D.
Graceful birches popular despite pests and short life.
Amer. Nurserym., 1961, **113**(3): 20-1, 65-72, illus.

Fourteen recommended species and varieties are briefly described and 70 not recommended are listed.

5090. Pancho, J. V., Capinpin, J. M., and Bardenas, E. A.
Chromosome number and fertility tests in bougainvillea.
Philipp. Agric., 1960, **44**: 11-18, bibl. 8, illus.

5091. Kitamura, F., and Ina, H.
On the seedage of cherries in Japan.
J. Jap. Inst. Landsc. Architects, 1958, **22**(2): 1-4, from *Rec. Res. Fac. Agric. Univ. Tokyo, 1958-59*, 1960, No. 9, Abstr. 21.

Data are presented on the shape of seeds, germination percentages and behaviour, and seedling growth of 4 ornamental species, viz. *P. jamazakura*, *P. yedoensis*, *P. itozakura* and *P. lannesiana*.

5092. Shain, W. A.
Marketing potential for Mississippi Christmas trees, with special reference to Arizona cypress.
Bull. Miss. agric. Exp. Stat. **582**, 1959, pp. 10, bibl. 4, illus.

The culture of *Cupressus arizonica* as a quick-growing substitute for the usual Christmas tree species.

5093. Wyman, D.
Many forms of four arborvitae species grown in the trade.
Amer. Nurserym., 1961, **113**(7): 10-11, 67-73, 76-9, illus.

A classification of varieties of *Thuja occidentalis*, *T. orientalis*, *T. plicata* and *T. standishi* into types recommended, those needing further trial and those not recommended.

5094. Heimann, M.
Beziehung zwischen Transpiration und "Erica-Sterben". **(The connection between transpiration and the death of ericas.)**
Gartenwelt, 1960, **60**: 479-81, bibl. 1, illus.

An unfavourable water balance, together with a simple or mixed infection of the roots by *Phytoph-*

thora, *Olpidium* or *Pestalotia*, frequently causes death of ericas, and can be controlled by shading or sprinkling with water to reduce transpiration. Spraying infected plants with a 0·5% solution of urea after planting out is also recommended.—Inst. PflKrankh., Geisenheim/Rheingau.

5095. Korobicyn, V. G.
Measures for the control of a scale insect on euonymus. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(3): 26-7, illus.

Mineral oil emulsions and 0·1% parathion were applied separately or in combination for the control of a scale insect that was causing serious damage to evergreen euonymus hedges in the southern regions of the Soviet Union. Parathion caused 97–100% mortality of the larvae and maintained its activity for 20 days. With the mineral oils 2 sprays at an interval of 10–12 days were better than a single spray. The best results (100% control) were obtained with a 4% emulsion of preparation No. 30 [diesel oil, paraffin distillate, sulphite liquor and a surfactant] plus 0·1% parathion.

5096. Roe, M. J.
A taxonomic study of the indigenous Hawaiian species of the genus *Hibiscus* (Malvaceae).
Pacific Sci., 1961, **15**: 3-32, bibl. 19, illus.

Detailed descriptions of, and a key to, 9 species, 5 varieties and 1 form.

5097. Ramakrishnan, V.
Occurrence of ascidium in *Hibiscus rosa-sinensis* L.
Sci. and Cult., 1960, **26**: 281-2, bibl. 3, illus.

Details of a structural abnormality.

5098. Frierson, J. L.
Cytotaxonomic study of selected indigenous and introduced species of the genus *Ilex*, commonly grown in the United States.
Diss. Abstr., 1960, **21**: 288, being *L.C. Card No. Mic.* 60-1523 of 115 pp.

5099. Herridge, E. A.
Histological differentiation of fungal, chemical, mechanical, and insect damage to holly leaves.
From abstr. in *Phytopathology*, 1961, **51**: 65.

Fungal and chemical damage are both effected through the stomata on the adaxial surface of leaves. Red-black swollen spots, which ultimately appear on both leaf surfaces, are characteristic of fungal spotting. Chemical damage produces discrete, round spots, slightly raised, and always red-black spotting on the adaxial surface only. Both mechanical and insect damage are stimulated by direct penetration of the cuticle and epidermis. Mechanical damage is distinguished by funnel-shaped lesions; lesions from insect injury generally involve individual epidermal cells. [See also *H.A.*, 31: 3036.]

5100. Kosugi, K., and Arai, H.
Studies on flower bud differentiation and development in some ornamental trees and shrubs. VII. On the date of flower bud differentiation and flower bud development in *Hydrangea macrophylla*. [Japanese, with English summary ¼ p.]
Tech. Bull. Fac. Agric. Kagawa, 1960, **12**: 78-83, bibl. 9, illus.

Under Kagawa conditions inflorescence differentiation started on 18 October, petals and sepals were observed on 8 November and pistils developed on 29 November. Flower stalks elongated at the end of April and pollen and ovules were formed on 23 May. [For part VI, see *H.A.*, 28: 729.]

5101. Jansen, H.
Gibberellin-Anwendung bei Hortensien. **(Treatment of hydrangeas with gibberellin.)**
Gartenwelt, 1960, **60**: 482-3, bibl. 2, illus.

Thirty plants of the variety Gerda Steiniger were sprayed when the inflorescences were about 2 cm. in diameter with the GA preparation Gibboe, another 30 were sprayed at the same time and again 4 days later and a further 30 acted as controls. The single spraying advanced flowering by 5–6 days, the double spraying by 14 days, compared with the control. Keeping night temperatures low was advantageous. The taller varieties and the white varieties seemed to be the most responsive to GA. More than two sprayings or the use of the preparation Gibboe-konz resulted in poorer flower quality. —Inst. Bot., tech. Hochsch., Hannover.

5102. Stoutemyer, V. T., and Britt, O. K.
Effect of temperature and grafting on vegetative growth phases of Algerian ivy.
Nature, 1961, **189**: 854-5, bibl. 4.

The reversion of mature *Hedera canariensis* to its juvenile form when grafted onto juvenile stocks was investigated. By keeping plants at different temperatures in glasshouses at 80° F. and 60° F. and also in a lath-house it was shown that reversion occurred in all cases at 80° F. but in fewer cases at lower temperatures. A comparison of budding and grafting, when some mature scion wood was present in the latter but not the former method, showed fewer reversions to the juvenile form when mature tissue was present.—Univ. Calif., Los Angeles.

5103. Sen, P. K., and Basu, R. N.
Effect of growth substances on root formation in cuttings of *Justicia gendarussa* L. as influenced by varying levels of nitrogen nutrition of stock plants.
Indian J. Plant Physiol., 1960, **3**: 72-83, bibl. 22.

Root initiation was directly proportional to the C:N ratio, whereas shoot formation showed an inverse relationship. The highest root-promoting effect was obtained with NAA, followed by IBA and IAA; MH had an inhibiting effect. The differences in root-promoting effects were thought to be due to the different capacities of the hormones to stimulate the hydrolysis of carbohydrates and proteins. The presence of leaves was beneficial to root initiation only when root-promoting substances were applied. [For earlier work see *H.A.*, 30: 2684.]—Dep. Agric., Calcutta Univ.

5104. Dostál, R.
Gibberellinsäure und Knospenbildung bei *Syringa vulgaris*. **(Gibberellic acid and bud formation in lilac.)**
Naturwissenschaften, 1961, **48**: 139-40, bibl. 4, illus.

Smearing the basal part of the lamina of the subtending leaf with lanolin containing 1% GA was followed by the development of a winter bud with 16–18 pairs of scale leaves and 0, 1 or 2 pairs of foliage leaf primordia, in contrast to 3–5 pairs of scale leaves with bract and flower primordia in the controls.—Bot. Inst. landw. Hochsch., Brno, Czechoslovakia.

5105. Ewart, L. C., and Walker, D. E.
Chromosome numbers of poinsettia, *Euphorbia pulcherrima* Klotzsch.
J. Hered., 1960, **51**: 203-8, bibl. 13, illus.

Of 9 cultivars studied 5 had 28 somatic chromosomes and 4 had 56. Progenies with 42 chromosomes could not be obtained from 28 × 56 crosses. It is suggested that the cultivars are polyploids, the basic number for the species being 7.

5106. Wyman, D.
Bush forms of *Potentilla* gain garden interest despite confused names.
Amer. Nurserym., 1961, **113**(5): 16-17, 93-6, illus.

Notes on some 27 varieties of *P. fruticosa*.

5107. Härig, H.
Eisenmangelchlorosen bei Azaleen und Hortensien. **(Iron deficiency chlorosis in azaleas and hydrangeas.)**
Gartenwelt, 1961, **61**: 39, bibl. 4.

Chlorosis can be produced in azaleas and hydrangeas by low temperatures and by extended periods of rain or heavy watering, in addition to over fertilizing with Ca, P, Mn and Cu.

5108. MacGregor, J. L.
Poisoning of bees by rhododendron nectars.
Scot. Beekpr, 1960, **36**(4): 52-4, and *Brit. Bee J.*, 1960, **88**: 76-8, 88, from abstr. in *Bee World*, 1961, **42**: 26.

Including a list showing the toxicity of various species and hybrids.

5109. Davis, S. H., Jr., and Libby, J. L.
Diseases and insect pests of rhododendron and azalea.
Ext. Bull. Coll. Agric. Rutgers **345**, received 1960, pp. 30, illus.

With recommended control measures for each disease and pest.

5110. Graafland, W.
The parasitism of *Exobasidium japonicum* Shir. on azalea.
Acta bot. neerl., 1960, **9**: 347-79, bibl. 59, illus.

Studies on the life history of *Exobasidium japonicum* were carried out using rooted azalea cuttings. Captan at 0·2 g./l. strongly inhibited mycelial growth in a shake culture, and captan at 2 g./l. considerably reduced gall numbers when applied to buds on azalea shoots which were inoculated with a spore suspension at the same time. Control measures recommended are the removal of young galls before sporulation, and the application of fungicides particularly when sporulating galls are found.—Phytopath. Lab. "Willie Commelin Scholten", Baarn.

5111. Johnson, W. T.
Studies with several systemic insecticides for the control of azalea lace bugs.
J. econ. Ent., 1960, **53**: 839-41, bibl. 3.

Dimethoate, Di-Syston and phorate granules applied to the soil surface under azalea plants controlled two broods of azalea lace bugs (*Stephanitis pyrioides*) with a single application. The initial control brought about by the use of these chemicals seems to be caused by vapours. Phorate did not give systemic control when worked into azalea beds. No phytotoxicity was observed from any treatment, nor was the rooting response of cuttings taken from plants treated with demeton, Di-Syston or phorate affected. [From author's abstract.]—Univ. Md, College Park.

5112. Tompa, K., and Szent-Istavány, A.
Az akácmag vetésre való előkészítése tárcsás szkarifikátorral. **(The preparation of false acacia seed for sowing by means of disc scarification.)** [Russian and German summaries 1 p. each.]
Kert. szől. Főisk. Évk., 1959, **23**(7): 105-21, bibl. 19, illus.

False acacia [*Robinia pseudacacia*] in Hungary is used for many purposes, including vine stakes and rootstocks for ornamental acacia. The seeds, however, germinate poorly on account of their hard seed coat. Scarifying the seeds in a specially designed disc-scarifier for 15 minutes resulted in a higher percentage and more vigorous germination than scarifying them for shorter or longer periods, or than immersion in boiling water for 1–2 minutes, scalding, incision or treatment with sulphuric acid.

5113. KOVANDA, M.
Flower and fruit morphology of *Sorbus* in correlation to the taxonomy of the genus. [In English.]
Preslia, 1961, **33**: 1-16, bibl. 31, illus.
Includes a description of 9 Czechoslovak species.

5114. BAGSHAW, F.
Cultivation of the waratah.
Agric. Gaz. N.S.W., 1960, **71**: 650-2, illus.
The propagation and culture of *Telopea speciosissima*, including notes on diseases and pests and their control.

5115. COSTA, A. S., AND CARVALHO, A. M. B.
Anomalia das fôlhas da quaresmeira, associada a ácaros. (**Leaf abnormality in *Tibouchina mutabilis* associated with mites.**) [English summary 11 lines.]
Bragantia, 1960, **19**: vii-x, illus.
Curling and mosaic-like spots on the leaves are associated with the presence of *Aciota costae*, which has been successfully controlled with Kelthane.

SUB-TROPICAL FRUIT AND PLANTATION CROPS.

Avocadoes.

(*See also* 5160, 5166, 5209, 5260, 5572, 5584.)

5116. SALIMEI, F. S.
La *Persea drymifolia* od albero del burro od aguacate. (***Persea drymifolia*, the butter tree or avocado pear.**)
Ital. agric., 1961, **98**: 71-6, bibl. 2, illus.
This species (considered by some as a variety of *P. gratissima*) is a native of Mexico, and, being far more cold-resistant than *P. gratissima*, will grow in Mediterranean regions. The tree is sometimes planted as an ornamental species along roads. Near the coast it is injured by salt-laden winds. The fruits are smaller than those of *P. gratissima*. Brief notes on climatic and soil requirements, propagation and fruit composition are included.

5117. DE LA ROCHA, G., AND FLORES, D.
Ensayo de absorción de nitrógeno por las hojas (abonamiento foliar) en cultivos frutícolas. (**Trial on nitrogen absorption through the leaves (foliar fertilization) in fruit crops.**)
Inf. mens. La Molina, 1958, **32**(373): 12-15.
The application of Nugreen several days after irrigation improved growth, leaf size and colour and fruit size in avocado, Washington Navel orange and strawberry but had no effect with mango. Suitable rates of application were 5 lb. per 100 gal. water for strawberries, 10 and 15 lb. for 6-month-old and 2-year-old oranges, respectively, and 20 lb. for avocadoes.

5118. LABANAUSKAS, C. K., AND OTHERS.
Effects of irrigation and nitrogen on micronutrient concentrations in Hass avocado leaves.
Calif. Agric., 1961, **15**(2): 11.
See *H.A.*, 31: 3071.

5119. HIELD, H. Z.
Avocado fruit set.
Calif. Citrogr., 1961, **46**: 115-17, bibl. 5.
Treatment of Fuerte avocado trees with sprays of n-meta-tolyl phthalamic acid (7R5), at 0·25, 0·3, 0·4 and 0·5%, increased the number of small, slender, seedless fruits but did not favourably affect the set of normal fruits. The higher concentrations caused some leaf damage. GA at 100 p.p.m. also increased the number of seedless fruits but not the set of normal fruits.—Univ. Calif., Riverside.

5120. ROSSETTI, V.
Podridão das raízes do abacateiro. (**Root rot of avocado trees.**)
Biológico, 1960, **26**: 249.
To prevent infection of avocado roots by *Phytophthora cinnamomi* Brazilian growers are advised to plant in well drained soil, liming the planting holes or, in small orchards, fumigating the soil with suitable chemicals, and to select resistant varieties.

5121. JONES, J. K. N., AND WALL, R. A.
Isolation of D-glycero-D-galacto-heptitol from the wound exudate of avocado trees.
Nature, 1961, **189**: 746, bibl. 4.
Characteristics of perseitol reported.

Carobs.

5122. DICKINSON, T. A.
Carob: a crop that grows like a weed.
West. Fruit Gr, 1960, **14**(12): 27-8, illus.
The income from several varieties is estimated at 8 times the cost of keeping them in bearing condition. Quality standards may be maintained by growing only worm-resistant varieties. The local varieties Bolser and Santa Fe and the Tunisian variety Sfax appear most suitable for southern California. For soil conservation it is recommended that carob trees should be planted on contours of 1% gradient at a density of 50 trees/acre. The many uses of carobs are listed.

Citrus—varieties, propagation and rootstocks.

(*See also* 3618, 3823, 3849, 5141, 5151, 5171, 5175, 5584.)

5123. Krishnamurthy, S., Singh, R., and Deo, P. V.
Identification of citrus species by colorimetric tests.
Indian J. Hort., 1960, **17**: 107-11, bibl. 10.

Colour reactions are reported of the bark of 8 *Citrus* spp., of *Fortunella japonica* and of some interspecific hybrids in 3 colorimetric tests. It was possible to identify all the material under study. Interspecific hybrids did not show any resemblance to the parent species in their colour reactions. The colour reactions with ammonium molybdate showed that *C. limon* and *C. jambhiri* are distinct from one another. Similarly *C. limettioides* is distinct from *C. aurantifolia*, and *C. grandis* from *C. paradisi*. These tests are not only useful in the identification of citrus rootstocks, but can also provide supporting evidence in the classification of *Citrus* species. [From authors' summary.]—I.A.R.I., New Delhi.

5124. Džanelidze, V. S., and Razmadze, E. G.
First results of government variety trials of lemons. [Russian.]
Sadovodstvo, 1960, No. 10, pp. 27-30.

Yield, frost resistance and resistance to mal secco were established for 10 varieties at 6 testing centres in Georgia. In regions where the trees are not severely injured by frost or attacked by mal secco the varieties Novogrusinskij, Villafranca, Udarnik and Genoa could be recommended, but where these two problems are more serious Meyer lemon would be more satisfactory.

5125. Sacco, T.
Ricerche sul *Citrus paradisi* Macf. della Somalia. (**Studies on grapefruit in Somalia.**)
Riv. Agric. subtrop., 1960, **54**: 88-99, bibl. 11, illus.

The varieties recommended for growing in Somalia are listed, and sour orange is advised as rootstock. Data on juice composition are given for Marsh Seedless and Foster, both recommended for the fruit-juice industry.

5126. Mamporija, F. D.
The new orange variety Slava Mičurina. [Russian.]
Agrobiologija, 1960, No. 4, pp. 517-21, bibl. 3, illus.

The variety Slava Mičurina [Mičurin's Glory], which is claimed to have improved frost resistance and yielding capacity, is a vegetative hybrid obtained by grafting Washington Navel into the crown of *Poncirus trifoliata*. The morphology of the tree is described, and it is stated to be readily distinguishable from the parents. Leaves, flowers and fruit are also described.

5127. Deszyck, E. J., and Ting, S. V.
Processed products from Murcott orange. Part 1. Availability and characteristics of fruit.
Proc. Fla St. hort. Soc., 1960, 1961, **73**: 276-9, bibl. 11.
Murcott orange products. Part 1. Availability and characteristics of fruit.
Citrus Veg. Mag., 1961, **24**(6): 22-3.

The fresh Murcott honey orange has exceptional fruit and juice qualities for which there is a great demand; consequently only limited supplies are processed. It reaches prime eating quality after most tangerine and mandarin hybrid fruit have been harvested and is claimed to have excellent shipping and keeping qualities. Murcott tends to bear in alternate years large yields of small fruit and small yields of large fruit. The yield is also affected by the type of rootstock used.—Fla Citrus Exp. Stat., Lake Alfred.

5128. Shannon, L. M., Frolich, E. F., and Cameron, S. H.
Size and growth habits of trifoliate orange selections.
Calif. Agric., 1961, **15**(5): 10-11, illus.

See *H.A.*, 31: 3101.

5129. Ali, N., and Khan, D. A.
Cost of raising citrus fruit plants in the nursery.
Punjab Fruit J., 1960, **23**(81): 16-20.

Itemized costings for the raising of seedling rootstocks and Kaghzi lime seedlings in the Punjab.

5130. Vullin, G.
Le repiquage des bigaradiers à la station expérimentale d'agrumiculture de Corse. (**Transplanting sour orange plants at the Corsica experimental station for citrus growing.**) [English, German, Spanish and Russian summaries approx. 13 lines each.]
Fruits d'Outre Mer, 1960, **15**: 447-9, illus.

The tractor-drawn machine described is used to plant seedlings in the nursery at 75 × 25 cm. It requires 2 operators to clip the plants onto the vertical rotating disk. Each clip is automatically released when the plant is in position between the earthing-up wheels, which press the soil firmly up to the level of the collar. Hand transplanting 1 ha. (approximately 40,000 plants), including preparation of the plants and marking out the rows, costs 2·6 times as much as machine transplanting and takes very much longer. The machine, however, should not be used on either wet or very loose soils.

5131. SALIBE, A. A., AND ROESSING, C.
Conservação de hastes de citros destinadas a enxertia. **(Storage of citrus budwood.)** [English summary 4 lines.]
Bragantia, 1960, **19**: liii-lvi.

Of 7 methods compared for Hamlin orange budwood storage in plastic bags at 6–8° C. gave the best results when budding took place after 18 days' storage.

5132. ZHEZIANG WHANGYAN CITRUS EXPERIMENTAL STATION.
Quicker and cheaper propagation of citrus nursery stock.
Chinese J. Agric., 1958, **22**: 38, from *Biol. Abstr., Sect. D*, 1961, **36**, Abstr. 21,944.

Propagation by cuttings held at 25 to 30° C. was successful from spring to autumn. The cuttings were treated with a 200 p.p.m. IAA solution for 24 hours before planting, and 100% rooting was achieved in 30 days.

5133. MARLOTH, R. H., AND BASSON, W. J.
Empress mandarin as a rootstock for citrus.
J. hort. Sci., 1960, **35**: 282-92, bibl. 13.

Long-term investigations are described in which Empress mandarin has shown itself resistant to several virus diseases; it is polyembryonic and able to impart slow but satisfactory growth, high yields and quality. It is recommended as a stock for oranges, especially on sandy soils and in areas where tristeza is active.—Citrus and subtrop. hort. Res. Stat., Nelspruit.

5134. ALI, N., AND RAHIM, A.
Influence of different rootstocks on the seasonal changes in the vitamin "C" content (ascorbic acid) of the Valencia Late sweet orange.
Punjab Fruit J., 1960, **23**(81): 10-15, bibl. 10.

Of the 8 rootstocks used Seville Kimb (sour orange) produced Valencia oranges with the highest average ascorbic acid content and rough lemon and Jullundari Khatti oranges with the lowest content. The difference is considered to be due to the size and weight of the fruits, which were medium on the sour orange stock but abnormally large on the rough lemon and Jullundari Khatti.

5135. MONTENEGRO, H. W. S., AND OTHERS.
Influência do porta-enxêrto no número de sementes da laranja. **(The effect of the rootstock on the number of seeds in oranges.)**
An. Esc. sup. Agric. Queiroz, 1959, **16**: 79-85, bibl. 3.

Seed numbers were above average in the orange variety Baianinha when Sampson tangelo was used as the rootstock. The same effect resulted from grafting Maracanã on Pêra orange.

Citrus—climatic and other environmental factors.

5136. NIJJAR, G. S.
Quantitative tests for measuring cold hardiness of citrus seedlings.
Indian J. Hort., 1960, **17**: 112-21, bibl. 16.

Electrical conductivity of intact tissue or tissue extract, chemical analysis of tissue for water-soluble proteins and the plasmolysis test employing balanced salt solutions were all unsatisfactory for measuring cold hardiness. Satisfactory results were obtained by freezing the seedlings at 23° F. for 3 hours followed by thawing at 35° F. They were then kept at 78° F. for 3 weeks and the rates of recovery of hardened and unhardened seedlings compared.—Univ. Fla, Gainesville.

5137. SITES, J. W.
Preconditioning of plants in relation to cold resistance.
A.R. Fla agric. Exp. Stats, 1958-59, p. 121.

Sour orange seedlings grown at a constant temperature of 78° F. withstood freezing temperatures better than plants which were given an intervening pre-conditioning temperature of 38° F. before freezing. [See also *H.A.*, 30: 5972.]

5138. NADARAJA, G. B.
Increasing the winter hardiness of citrus crops.
[Russian, with English, German and French summaries 5 lines each.]
Vestn. sel'sk. Nauki, 1961, 6(1): 51-3, illus.

Of 3 methods of soil management paper mulch until August and then legume cover crops resulted in better growth and more frost resistant plants than either clean cultivation until August or the April sowing of legumes which were ploughed in at the end of August. Soil moisture and temperatures were first higher under the paper mulch and then lower under the legume cover, thereby causing growth to cease earlier. Under these conditions lemons withstood −6° and mandarins −8° C. When various covering materials were tried, 3 layers of cheesecloth gave the maximum protection, lemons so covered withstanding −9° without snow and −15° C. under a snow blanket.

5139. TURRELL, F. M., AUSTIN, S. W., AND PERRY, R. L.
Water, heaters and wind machines.
Calif. Citrogr., 1961, **46**: 154-60, bibl. 1.

Trials on $5\frac{1}{2}$-year-old Ruby and Marsh grapefruit, using heaters and wind machines, with half the grove irrigated during the coldest nights and the other half left unwatered, showed that the dry trees were more susceptible to frost damage, since the irrigation water contributed heat to the air, trees and soil and helped the ground heat to rise to the soil surface whence it was circulated by wind movement. [See also *H.A.*, 31: 3116.]

5140. Hunziker, R. R.
Water damage to citrus in the Indian River Area in 1959.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 357-64, bibl. 6.

Heavy rains caused extensive water-logging and consequent loss of feeder roots followed by defoliation. Cutting back affected trees to limbs $\frac{3}{4}$–$1\frac{1}{2}$ in. in diameter was better than harder cutting back. Once recovery had begun the application of fertilizer close to the trunk proved helpful.

5141. Ford, H. W., and Prevatt, R. W.
Tolerances of four citrus rootstocks to free water in certain sandy soils.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 231-2.

Seedlings of rough lemon, sour orange, sweet orange and Cleopatra mandarin which were flooded for 12 months starting in January showed no visible symptoms of water injury. Seedlings flooded in April showed leaf symptoms of water injury after 5 weeks and those flooded in June, July or August within 2 weeks. Seedlings growing in sub-soil showed water injury symptoms sooner than those growing in top-soil when flooded during the summer. They tolerated free water in sub-soil to which dolomitic limestone had been added for a longer period than in soil without this addition. [For earlier work, see *H.A.*, 30: 4303.]

5142. Miller, M.
Tensiometers and better irrigation.
Calif. Citrogr., 1961, **46**: 144, 146-8.

For use in orange groves.

Citrus—soil management, nutrition and mineral composition.

(*See also* 3937, 3942, 4368, 5117, 5138, 5169, 5180, 5367, 5560.)

5143. Gallo, J. R., and Rodriguez, O.
Efeitos de algumas praticas de cultivo do solo, na nutrição mineral dos citros. (**Effect of certain soil management practices on the mineral nutrition of citrus.**) [English summary $\frac{3}{4}$ p.]
Bragantia, 1960, **19**: 345-60, bibl. 14, illus.

The effects of 5 soil management practices on leaf N, P, K, Ca, Mg, Fe and Mn in Hamlin on Caipira sweet orange stock were investigated at Limeira Experimental Station. The mean annual yields per 64 trees were 5,358 kg. with mulching (*Melinis minutiflora* 15 cm. thick), 3,897 kg. with clean weeding in the dry season plus green manuring with *Stizolobium aterrimum* in the rainy season, 3,176 kg. with clean weeding in the dry season plus green manuring with *Cajanus cajan* in the rainy season, 3,052 kg. with 2–3 superficial hoeings and 2,606 kg. with permanent clean weeding with herbicides. The chief results and conclusions were: (1) leaf N was lower with mulching, suggesting the need for N fertilization with this treatment, (2) leaf P was significantly higher with mulching and green manuring, (3) yields and leaf P followed the same trend, (4) liming plus mulching increased Ca and Mg uptake, (5) Fe and Mn absorption were lower with mulching, (6) yields with clean weeding plus *Stizolobium* green manuring were promising in view of the low cost of this treatment and (7) mulching was expensive.

5144. Harding, R. B., and Ryan, T. M.
Effects of tillage and fertilizers on use of water and soil salinity in irrigated orange orchard at Riverside.
Calif. Agric., 1961, **15**(3): 9-11.

In non-tilled soils the improved water intake associated with low soil salinity was confined primarily to the tree irrigation furrows, the structure of the soil between the rows being adversely affected by orchard equipment traffic. Salinity was much less in a soil treated with calcium nitrate than in soils treated with sodium nitrate or ammonium sulphate. Salt distribution in the soil showed a definite inverse relationship with water distribution.—Univ. Calif., Riverside.

5145. Kretchman, D. W., and Simanton, W. A.
Weed control in citriculture.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 247-8.

Of 41 treatments applied to the root zone of young bearing citrus trees the following gave good weed control without causing any apparent injury: diuron at 20 lb./acre, dalapon at 2·5, simazine at 40, atrazine at 20, trietazine at 40, methoxy propazine at 20 and propazine at 40 lb./acre. Brush and grass in grove ditches were effectively controlled by fenuron plus dalapon or 2,4,5-T(triethylamine) plus dalapon. When potted seedlings of 4 citrus rootstocks were irrigated with 2 in. of water containing dalapon, amitrole and fenuron-trichloroacetate at 15 and 30 p.p.m. and TCA at 150 and 300 p.p.m., rough lemon appeared the most tolerant to the TCA and amitrole, Cleopatra mandarin, followed by sour orange, to the dalapon and sweet orange to the fenuron-trichloroacetate treatments. Bermuda grass (*Cynodon dactylon*) was nearly eradicated from a planting site by dalapon at 8 lb./acre applied in 2 equal rates with a 10-day interval. Rough lemon seedlings planted at weekly intervals after the second treatment showed no ill-effects up to 6 months.

5146. Chapman, H. D.
Le diagnostic foliaire et l'analyse du sol des plantations d'agrumes comme moyen de guider les pratiques de fertilisation du sol. (**Foliar diagnosis and soil analysis in citrus orchards as means of guiding soil fertilizing practices.**)
Fruits d'Outre Mer, 1960, **15**: 435-41, bibl. 3.

See *H.A.*, 31: 1264 for an English version.

5147. JONES, W. W., AND EMBLETON, T. W.
Leaf analysis as a guide to nitrogen fertilization of oranges.
Calif. Agric., 1961, **15**(1): 14.

See *H.A.*, 31: 3128.

5148. SATŌ, K., ISHIHARA, M., AND KURIHARA, A.
Seasonal absorption of nutrient elements by citrus and pear trees (1952-1955). [Japanese, with English summary 1 p.]
Bull. nat. Inst. agric. Sci., Hiratsuka. Ser. E. 1958, No. 6, pp. 161-98, bibl. 6.

Mature citrus trees grew most rapidly in June and September, whereas young trees made their maximum growth in August-September. The maximum growth of pear trees occurred in August. In mature citrus maximum absorption of N occurred in June: in pear trees this happened in May with secondary peaks in September and July. Highest absorption of P_2O_5 was in May in citrus and in June in pears, absorption continuing over a longer period than with other elements. Maximum absorption of K_2O was in June in citrus and in May in pears. In young trees, by comparison with mature trees, absorption was less in the early part of the season and much more in the latter half.

5149. SATŌ, K., ISHIHARA, M., AND KURIHARA, A.
Studies on the leaf analysis of fruit trees. V and VI. Parts 16 to 20. [Japanese, with English summaries.]
Bull. nat. Inst. agric. Sci., Hiratsuka. Ser. E, 1958, No. 6, pp. 109-44, bibl. 21, pp. 145-60, bibl. 12, and No. 7, pp. 1-16, bibl. 22, illus., pp. 17-39, bibl. 26, illus., pp. 41-54, bibl. 6.

Surveys of Satsuma orange groves showed that Mg deficiency symptoms became apparent if the leaf content fell below 0·3%, or if the soil content was below 1 m.e./100 g. A study of greenhouse grapevines showed no correlation between the chemical composition of the soil and that of the leaves. In peach orchards no correlation was found between the N and P contents of soil and leaves, but a moderate correlation was found between soil and leaf K, Ca and Mg. A non-fruiting Satsuma orange tree with vigorous shoot growth had leaves with lower N and P contents than those of a fruiting tree; leaf K content, on the other hand, was reduced by fruiting owing to decreased absorption of K compared with the absorption of N. With Satsuma orange trees grown in sand culture the application of large amounts of P tended to depress growth when the N supply was deficient. P deficiency caused browning of the new roots, whereas with N deficiency the roots remained white even in the absence of P. N, P and K leaf contents are quoted for a pot experiment involving the application of these elements, each at 4 different levels. Antagonistic relationships were found between applied N and the leaf P and K contents, applied P and leaf N, applied N or K and leaf Mg, and applied N or K and the B content of the leaves. Synergistic relationships were found between applied N or P and leaf Mn and between applied P and leaf Mg. In pot experiments with Satsuma oranges leaf weight was found to increase with increasing supply of N fertilizer, but was not affected by applied P and K. In a survey of orchards of low and high productivity only a slight correlation was found between leaf weight and leaf N content. In this survey deficiency of N, P or K was not found to be the cause of low productivity. [See also *H.A.*, 30: 2726: for IV, parts 13-15, see *H.A.*, 27: 755.]

5150. GALLO, J. R., AND OTHERS.
Composição inorgânica das fôlhas de laranjeira Baianinha, com referência à época de amostragem e adubação química. (**Inorganic composition of Baianinha orange leaves in relation to sampling date and chemical fertilization.**) [English summary 9 lines.]
Bragantia, 1960, 19: 229-46, bibl. 13, illus.

In this trial N, P_2O_5 and K_2O were applied at nil, low and high rates, the low rates being 150, 200 and 150 g., respectively, per tree per annum. Age was the chief factor affecting the principal inorganic constituents of the leaf. The N, P and K contents of leaves produced in spring tended to decline with increasing age. The Mg content decreased almost throughout the growing cycle, but increased in old leaves at the time of the spring flush. The Ca content rose rapidly in new leaves and then remained fairly constant. Leaf contents closely followed changes in soil contents due to chemical fertilization. Leaf N and P increased linearly with the rate of fertilizer application. Leaf K increased only with the low rate of K fertilization. N fertilization tended to reduce leaf K and leaf P and to increase leaf Mg. P fertilization reduced leaf N and, in general, leaf K and increased leaf Ca. K fertilization reduced leaf Ca and Mg. The following significant negative correlations between mineral constituents in the leaf were observed: N×P, N×Ca, K×Ca and K×Mg. Leaves of 3–6 and of 10 months old proved suitable for sampling.

5151. GALLO, J. R., AND OTHERS.
Influência da variedade e do porta-enxêrto, na composição mineral das fôlhas de citros. (**Effect of variety and rootstock on the mineral composition of citrus leaves.**) [English summary ½ p.]
Bragantia, 1960, 19: 307-18, bibl. 18.

The N, P, K, Ca and Mg contents of the scion leaves were investigated in trials at Limeira Experimental Station involving different stock-scion combinations of 2 sweet orange varieties (Pêra and

Baianinha) and 5 rootstocks (Pêra sweet orange, Caipira sweet orange, Rangpur lime, rough lemon and Cleopatra). The scion leaves differed mainly in their K content, which was higher in Baianinha. Scion leaf composition also varied with rootstock, the K, Ca and Mg contents being significantly different with the same scion on Pêra and Cleopatra stocks. Virus tolerance and age also affected leaf contents.

5152. (Cahoon, G.)
New research findings: root growth.
West. Fruit Gr, 1961, **15**(2): 47-8.

After more than 30 years of 6 different N treatments in a citrus orchard significant differences were found in the growth and distribution of feeder roots in the top 3 or 4 ft. of soil. In general, urea and ammonium sulphate treatments produced the highest feeder root concentrations at this depth. Calcium nitrate, no N and manure produced fewer roots. The roots in the ammonium sulphate, sodium nitrate and manure treatments were more evenly distributed in the upper 2 ft. of soil than those in the other treatments. As a rule fertilizer treatments that caused the highest rate of water infiltration produced the lowest root densities and vice versa.

5153. Leonard, C. D., and Stewart, I.
Yellow-vein in citrus.
Proc. Fla St. hort. Soc., 1960, 1961, **73**: 69-79, bibl. 14, illus., and *Citrus Ind.*, 1961, **42**(2): 5-7, 12-15, bibl. 14.

Yellow veined leaves had lower N contents than normal green leaves. When sodium nitrate (5 lb. per tree), or equivalent N as ammonium sulphate, was applied to affected Valencia orange trees, all yellow veined leaves became green again within 3 months, and the N and Ca leaf contents were increased. Treatment of 3-year-old grapefruit trees with 1 or 2 applications of 4 lb. of ammonium sulphate, calcium nitrate or sodium nitrate produced greening and increased leaf N in all cases, ammonium sulphate giving the best results. The Ca content of the leaf was increased by all treatments. Applications of Ca without N increased the Ca leaf content but did not correct the yellow-vein symptoms. In some sand-culture experiments yellow-vein appeared on grapefruit and orange trees when N or N plus Ca were withheld but not on trees deprived of Ca or B only.—Fla Citrus exp. Stat., Lake Alfred.

5154. Leonard, C. D., and others.
Citrus nutrition studies.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 206-9, illus.

Yellow veining: This condition, sometimes called "winter chlorosis", was shown to be caused by N deficiency. Its common occurrence in commercial groves is believed to be due to heavy leaching of N by summer rains followed by insufficient rainfall after autumn fertilization to move the N down to the roots. *Potassium studies:* In a short-term experiment with K-deficient orange trees it was found that K should be applied by 15 April to have an effect on the quality of the current crop.

5155. Domato, J., and Ratkovic, M.
Influencia de la fertilización completa N-P-K en la producción citrícola. **(The effect of complete N-P-K fertilizing on citrus production.)**
Idia, 1960, Suppl. No. 1, pp. 230-2, illus.

Irregular yields and small fruit size due to P deficiency were remedied by green manuring with cowpeas, followed by placement of a 10–20–10 fertilizer in a circular band in the region of the absorbing roots, which, if normally developed, extend outside, but not directly under, the crown of the tree. Application of P alone was unsatisfactory, inducing prolific premature flowering.

5156. Rasmussen, G. K., and Smith, P. F.
Effects of calcium, potassium, and magnesium on oxalic, malic, and citric acid content of Valencia orange leaf tissue.
Plant Physiol., 1961, **36**: 99-101, bibl. 14.

A fuller account of work abstracted in *H.A.*, 31: 3131, with some minor changes in figures.

5157. Bar-Akiva, A.
Biochemical indications as a means of distinguishing between iron and manganese deficiency symptoms in citrus plants.
Nature, 1961, **190**: 647-8, bibl. 7, illus.

Chromatographic studies of leaf samples from several citrus species grown in cultures deficient in Fe and Mn showed degradation of sugars and the appearance of free pentose, respectively. Details are given of chemical analyses to show peroxidase activity, free pentose content and chlorophyll content, which are considered useful means of diagnosis to supplement visual and other methods of identifying these deficiencies.—Nat. Univ. Inst. Agric., Rehovot-Beit-Dagan. Israel.

5158. Ahmad, S.
Iron chlorosis in citrus orchards.
Punjab Fruit J., 1960, **23**(81): 4-9, bibl. 37.

Symptoms and causes are described and the literature reviewed. For acid soils the use of Fe-EDTA is recommended, but on calcareous soils repeated foliar sprays of iron sulphate should be given .

5159. Wallihan, E. F.
Effect of sodium bicarbonate on iron absorption by orange seedlings.
Plant Physiol., 1961, **36**: 52-3, bibl. 5.

Cultured seedlings were transferred to nutrient solutions containing labelled iron as $FeSO_4$ and either Na_2SO_4 or $NaHCO_3$. After 5 hours' exposure the aerial parts were harvested. Whereas substantial quantities of labelled Fe had moved into the tops of the sodium sulphate series, none was detectable in the bicarbonate-treated plants. Furthermore, since Fe concentrations in the roots of the latter plants were lower than in those of the former, it is probable that the effect of the bicarbonate was to reduce iron absorption by the roots.—Univ. Calif., Riverside.

5160. Haas, A. R. C., and Brusca, J. N.
Effects of chromium on citrus and avocado grown in nutrient solutions.
Calif. Agric., 1961, **15**(2): 10-11, illus.

In sand cultures Cr at 0·1 p.p.m. had a better effect on the growth of Prior Lisbon seedlings than did higher concentrations or no chromium; in soil cultures watered with nutrient solutions this was also the best level. Growth of Koethen sweet orange seedlings in soil cultures was highest at 0·0125 and 0·075 p.p.m. Cr, but fresh weights of the tops were heaviest at 0·05 p.p.m.; in sand cultures growth was stimulated most at 0·075 p.p.m. Harman avocado seedlings also responded to low concentrations of Cr in the nutrient solution by making increased growth.—Univ. Calif., Riverside.

Citrus—growth, reproduction and physiology.

(*See also* 3724, 3849, 5135, 5152.)

5161. Long, W. T.
Topping old trees in the Indian River area.
Citrus Veg. Mag., 1961, **24**(5): 15, illus.

Vigorous, normal-sized leaves resulted from all 4 methods of pruning described. The best results were achieved when 3–4 ft. were cut from the top of the tree and 12–18 in. from the perimeter. This resulted in satisfactory blossoming in the spring following January pruning.

5162. Ahmad, S.
Alternate bearing in citrus fruits.
Punjab Fruit J., 1960, **23**(81): 1-3.

Tables are given which show biennial bearing in Marsh Seedless grapefruit and in 8 varieties of mandarin, among which it was most marked in Kinnow.—Punjab agric. Coll., Lyallpur.

5163. Milella, A.
Ricerche sulla differenziazione delle gemme del mandarino. (**Studies on bud differentiation in mandarins.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 364-9, bibl. 11, illus.

As in other evergreen fruit trees, the buds of mandarins differentiate at the end of the winter growth stasis. Anatomical pre-differentiation of flower buds occurs towards the end of January, followed by true morphological differentiation during the first few days of March. Defoliation experiments showed that, from the physiological aspect, the fate of these buds was determined at least 20 days before the onset of morphological differentiation. Branches defoliated from 6 January onwards produced progressively greater numbers of flowers. Compared with oranges, flower bud initiation in mandarins is later, but differentiation is earlier.—Ist. Colt. arb., Univ. Sassari.

5164. Singh, J. P., and Dhuria, H. S.
Studies on blossom-bud differentiation in sweet lime (*Citrus limettioides* Tanaka).
Indian J. Hort., 1960, **17**: 102-6, bibl. 7, illus.

The first sign of flower-bud differentiation, viz. a broadening and flattening of the apical meristem with 2 lateral protuberances, was observed on 28 and 22 January in 1958 and 1959, respectively, when conditions were favourable for growth. A larger number of buds were differentiated in the earlier than in the later growth flushes and there were more terminal than lateral buds. The period of differentiation lasted for 2 weeks.—I.A.R.I., New Delhi.

5165. Robinson, F. A., and Krezdorn, A. H.
Factors affecting the unfruitfulness of tangelos.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 106 and 228-9.

Nectar secretion in an Orlando tangelo grove varied widely from time to time, and on one day secretion ceased entirely while other varieties in the area continued to secrete sufficient nectar to attract bees. Under conditions of open pollination Temple orange was found to be outstandingly effective as a pollinator, and it was tentatively established that for effective cross-pollination Orlando trees should be no further than 2 trees from the pollinator. Trees girdled at petal fall showed a statistically significant increase of 2 boxes per tree over ungirdled trees (0·5 boxes) and over trees girdled at the start of flowering (0·4 boxes). Gibrel at 100 p.p.m. increased yields significantly without any adverse effects. [For earlier results, see *H.A.*, 30: 4321.]

5166. Todd, G. W., Bean, R. C., and Propst, B.
Photosynthesis and respiration in developing fruits. II. Comparative rates at various stages of development.
Plant Physiol., 1961, **36**: 69-73, bibl. 10.

Measurements were made on rates of photosynthesis and respiration in green orange, lemon and avocado fruits of various ages and sizes, ranging from 2·5 g. to over 200 g. Photosynthetic activity, per unit of surface, declined somewhat during growth in lemons and oranges, although little or no change was noted for avocadoes. Respiration in citrus drops rapidly during early growth causing an increase in the photosynthesis/respiration ratio in the larger fruit. In avocadoes there was little change in this ratio and the ratio was considerably smaller than for citrus. In no case did the photosynthetic rate of the various fruits exceed the compensation point, and in fluorescent light the rate of photosynthesis was well below the compensation point. It is concluded that the contribution of photosynthesis within a fruit towards its own development is small. The respiratory rate calculated on a surface basis remained almost constant for citrus fruit in the range of 30 to 200 g., whereas the respiration of avocadoes per unit of surface showed a marked increase with an increase in fruit size. This would indicate that respiration in the larger citrus fruits is more a function of surface than of the total mass of the fruit, the reverse being true for avocadoes. The effect on photosynthesis of interrupting food supply to the fruit was also examined. Using cucumbers and oranges photosynthesis was measured with fruit attached to normal plants but with the phloem of the fruit stem severed, attached to defoliated plants, or with the fruit completely detached. In contrast to an earlier report that similar treatments gave rise to large increase in photosynthetic rates in cucumbers, little or no stimulation of respiration or photosynthesis was produced by any of these treatments. Instead, there appears to be a gradual decline in both photosynthesis and respiration. [Authors' summary. For part I, see *H.A.*, 31: 1290.]—Univ. Calif., Riverside.

5167. Samygin, G. A., and Matveeva, N. M.
The vitality of sections of lemon leaves. [Russian, with English summary 3 lines.]
Fiziol. Rast., 1961, **8**: 114-16, bibl. 6.

Leaf disks of lemon kept in a moist chamber under weak light retained their natural colour and normal photosynthetic capacity for 6 years.

5168. Wallace, A., and Mueller, R. T.
Cyanide and chelating agent effects on *in vitro* CO_2 fixation in sweet orange leaves.
Plant Physiol., 1961, **36**: 118-20, bibl. 9.

The effects of cyanide, azide and chelating agents on dark fixation were compared using 2 substrates. The effects were related to the substrates, but, in general, cyanide increased fixation. The stimulating effect of a chelating agent was additive with either cyanide or azide.—Univ. Calif., Los Angeles.

Citrus—diseases.

(*See also* 3752, 4193, 5212, 5213, 5570.)

5169. Ruggieri, G.
Le malattie degli agrumi. (**Diseases of citrus.**)
Inf. fitopat., 1961, **11**: 33-41, illus.

Cultural and/or chemical treatments commonly used in Italy to control fungal, bacterial and nutritional deficiency diseases of citrus are reviewed, and the symptoms of the main virus diseases are described.

5170. Lenzi, A. M.
Suberosi di foglie di agrumi. (**Suberosis of citrus leaves.**) [English summary ¼ p.]
Boll. Staz. Pat. veg., Roma, 1959 (issued 1960), **17**: 169-80, bibl. 19, illus.

Orange and mandarin leaves developed corky patches on both surfaces, the phellogen originating in the mesophyll. The abnormality is apparently non-pathogenic.

5171. Wallace, J. M.
Virus diseases in South African citrus orchards.
Citrus Gr, 1961, No. 325, pp. 7-15.

Symptoms and eradication of psorosis, exocortis, xyloporosis, stubborn disease, tristeza and other disorders possibly caused by viruses, greening disease, naartjie decline, woody gall, bud union abnormalities and pinched union are discussed, together with rootstock studies in progress in South Africa and the use of nucellar clones.

5172. Majorana, S., and Salerno, M.
Due nuovi tipi di psorosi osservati su piante di agrumi. (**Two new types of psorosis observed in citrus plants.**)
Progr. agric., Bologna, 1961, **7**: 89-95, illus.

Psorosis B on the orange variety Sanguinello moscato (on sour orange rootstocks) and crinkly-leaf psorosis on the lemon variety Femminello are reported as being present in Italy for the first time. Elimination of infected trees, especially from nurseries, is urged.—Univ. Catania.

5173. Majorana, G., and Salerno, M.
La psorosi a foglia bollosa (crinkly-leaf psorosis): malattia da virus osservata su piante di limone (*Citrus limon* Linn.) in Sicilia. (**Crinkly-leaf psorosis, a virus disease observed on lemon trees in Sicily.**) [English summary ½ p.]
Tecn. agric., 1960, **12**: 514-23, bibl. 9, illus.

Lemon trees affected by this disease have a strong tendency to produce dwarf fruits. The only means of control appears to be the elimination of diseased plants and rootstocks.—Univ. Catania.

5174. Rangaswami, G., and Vasantharajan, V. N.
Studies on the rhizosphere microflora of citrus plants as influenced by streptomycin spray.
Curr. Sci., 1961, **30**: 25-6, bibl. 5.

The rhizosphere of acid lime plants was found to contain a population of micro-organisms 150 times larger than that of the surrounding soil, and spraying the foliage with 1,000 p.p.m. streptomycin sulphate did not affect it.—Annamalai Univ., Annamalainagar.

5175. Said, M., and Ryan, G. F.
Fungicidal treatment of citrus seed.
Calif. Citrogr., 1961, **46**: 125, 127, bibl. 4.

Albino and virescent (mottled green and white) seedlings are described, which die or have retarded early growth, respectively. The condition is non-genetic. Fungicidal treatment has had curative effects. Seeds of 10 different rootstocks were treated with various fungicides and stored in small polythene bags at 40° or 68° F., and later planted in shredded sphagnum at 80° F. With Cleopatra mandarin all the fungicides except captan prevented chlorophyll deficiency. Fermate treatment failed with sweet orange and increased albinism in grapefruit. Captan increased albinism in sweet orange and grapefruit, but albinism was low in captan-treated shaddock, Sampson tangelo and Rangpur lime. Parzate and Arasan treatment was followed by negligible albinism in orange and grapefruit. 8-Hydroxyquinoline and its sulphate both prevented the appearance of albinos in orange and grapefruit. Germination was retarded by treatment with some of the fungicides. —Univ. Calif., Los Angeles.

5176. Cohen, M.
Fungicidal control of melanose, scab and brown rot of citrus fruits.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 237-8.

Melanose: In a timing study tribasic copper sulphate at 1½ lb. per 100 gal., applied 3 weeks after petal fall, gave better control of melanose on Marsh grapefruit and Valencia oranges than when applied at full bloom or 2 days after petal fall. In an extensive screening test, using Pineapple oranges, treatments containing copper, including the above spray, applied 2 weeks after petal fall, were much superior to all other materials used. *Scab:* When sprays were applied at the late dormant stage and again at full petal fall for scab control on Temple oranges, Niacide Z was the best material, followed by Fermate and tribasic copper sulphate, each at 1½ lb. per 100 gal. *Brown rot:* In a season of low disease incidence several fungicides markedly reduced fruit drop.

5177. Kiely, T. B.
Speckled blotch of citrus.
Agric. Gaz. N.S.W., 1960, **71**: 474-6, illus.

The symptoms and the possible cause of this disease, which has severely affected Washington Navel and Valencia oranges, grapefruit and Emperor mandarin fruits, are described. It is suggested that it is an early form of black spot (*Guignardia citricarpa*) developing from latent infections. Control is obtained with 1 application of bordeaux mixture, 4–4–80, plus ½ gal. white spraying oil emulsion at petal-fall.

5178. Klotz, L. J.
Gum diseases of citrus in California.
Circ. Calif. agric. Ext. Serv. **396**, revised 1960, pp. 23, bibl. 28, illus.

The causes, symptoms and control of brown rot gummosis or foot rot (*Phytophthora* spp.), gummosis caused by other fungi, dry root rot, psorosis and exocortis. [See also *H.A.*, 31: 3156.]

Citrus—pests.

(*See also* 4293, 5567, 5570.)

5179. van Weerdt, L. G., Birchfield, W., and Esser, R. P.
Observations on some subtropical plant parasitic nematodes in Florida.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 443-51, bibl. 10, illus.

Details of species infesting citrus, various palms including coconuts, sugar cane and ornamentals, with some results of experiments on control.

5180. Simanton, W. A., and Kretchman, D. W.
Temporary elimination of host plants of the burrowing nematode from infested [citrus] grove lands.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 242-4.

The eradication of weed hosts of *Radopholus similis* from planting sites and barrier zones for 6 months or longer is an aid in eliminating this nematode. On a newly ploughed site 17 herbicidal treatments, each costing $50 per acre or less, all permitted more than 10% of the plot to be recovered by vegetation within 3 months. A mixture of Chlorea at 100 lb. per acre and diuron at 5 lb. per acre, however, gave better weed control than the other treatments. When herbicides were applied to barrier strips in June, 2 weeks after fumigation, diuron at 24 lb. per acre kept weed growth below 1% surface coverage for 12 months. Chlorea pellets at 300 lb. per acre kept weed growth down to 5% surface coverage.

5181. Suit, R. F., and others.
Control of spreading decline of citrus.
A.R. Fla agric. Exp. Stats, 1958-59, pp. 220-2.

Summarized results are given of 9 methods of treatment against *Radopholus similis*. [For earlier work, see *H.A.*, 30: 4335.]

5182. Atkins, E. L., Jr.
The beet armyworm, *Spodoptera exigua*, an economic pest of citrus in California.
J. econ. Ent., 1960, **53**: 616-19, bibl. 11, illus.
Beet armyworm on citrus.
Calif. Citrogr., 1961, **46**: 118-21, bibl. 5, illus.

The recent increase in beet armyworm infestations on newly planted citrus trees and nursery stock is believed to be due to the use of new rootstock-scion combinations, which grow much more rapidly than the former combinations and thus provide a continuous supply of succulent foliage for optimum development of the larvae. DDT 50% w.p., 2 lb./100 gal., or parathion 25% w.p., 2 lb./100 gal. gave very good, but short-term control, and should be applied every 2–3 weeks to deal with continuous reinfestation.—Univ. Calif., Riverside.

5183. GEORGALA, M. B.
Bollworm attacks South African citrus crops —control measures.
Citrus Gr, 1960, No. 323, p. 7.

Infestation by the American bollworm [*Heliothis armigera*] always coincided with blossoming. The life history of the pest is described. Control recommendations include the destruction of larvae before they reach ½ in. in length by the use of 5% DDT dust, which will also control citrus thrips, or a scale control spray of parathion, 3 lb. 25% w.p./100 gal., or parathion, 2 lb. 25% w.p./100 gal. plus Gusathion 1 lb. 25% w.p. or malathion 3 lb. 25% w.p.

5184. TOUZEAU, J.
Essai de lutte généralisée contre la cératite sur agrumes en 1959. (**An experiment on the large-scale control of Mediterranean fruit fly on citrus in 1959.**)
Rapp. Activ. Exp. Déf. Cult., 1959, 1960, No. 4, pp. 13-20.

Aircraft application of a malathion-protein mixture to alternate 15 m. strips of a 200-ha. citrus orchard was preferable to complete coverage (also by aircraft) with malathion alone. The trials are to be repeated to obtain data for heavier infestations.

5185. TOUZEAU, J.
Influence des traitements à grande échelle à l'aide d'appâts toxiques sur la population de cératites de la zone voisine. (**The effect of large-scale treatments with poisoned baits on the fruit fly population of adjacent areas.**)
Rapp. Activ. Exp. Déf. Cult. 1959, 1960, No. 4, pp. 21-5.

In citrus plantations where certain areas were treated with hydrolysed protein poisoned with malathion, the population of Mediterranean fruit flies at a distance of 30 m. from the edge of the treated areas was reduced by at least 77%.

5186. NUCIFORA, A.
Vecchi e nuovi acari dannosi agli agrumi in Italia. (**Old and new mites injurious to citrus in Italy.**) [English summary 6 lines.]
Tecn. agric., 1960, **12**: 501-13, bibl. 18, illus.

Red spider mites (*Tetranychus telarius*) on citrus should not be treated with chlorinated insecticides or with phosphoric esters which destroy their predators. The pest is not a problem in citrus orchards where DDT has been abandoned for fruit-fly control and where cyanide fumigation is used every 3rd year in combination with 1·5% mineral oil sprays against scale insects. Where cyanide fumigation is impossible, mineral oil applied at 2% in winter and 1·5% in summer gives good results. If such indirect control measures are insufficient, specific acaricides should be used. For controlling the bud mite (*Aceria sheldoni*) 2% mineral oil should be applied at the beginning of winter, and, where lemons are being forced, in July. In one instance a February application to young lemon trees gave complete control. The citrus rust mite (*Phyllocoptruta oleivora*) is new to Sicily, and is much commoner on forced lemons set in September than on those set in October.—Univ. Catania.

5187. DI MARTINO, E.
Due nuovi acari dannosi agli agrumi in Italia. (**Two new mites injurious to citrus in Italy.**)
Inf. fitopat., 1960, **10**: 356-8, bibl. 2, illus.

Brevipalpus phoenicis and *B. californicus* have appeared as pests on lemons and mandarins in Sicily, and the former also in Calabria. Control measures reported from other countries are noted. The rapid mite multiplication is attributed to disturbance of the biological balance by the widespread use of parathion and DDT against other pests.—Staz. Agrumic. Acireale, Catania, Sicily.

5188. TOUZEAU, J.
L'acarien des bourgeons des agrumes (*Aceria sheldoni* Ewing) sur citronniers en Tunisie. Essais de lutte. (**The citrus bud mite on lemons in Tunisia. Control experiments.**)
Rapp. Activ. Exp. Déf. Cult. 1959, 1960, No. 4, pp. 26-52.

A product containing 3% of parathion and 70% of summer oil, applied 3 times in winter at 1·5 l. per hl. of water, although very effective against the mites, caused a severe leaf drop in the following spring and summer. Where it was used 6 times a year for several years the biological balance was greatly disturbed. Micronized sulphur (70% pure) at 500 g./hl. caused no damage to the crop at any season and gave very good control of the mites without evident disturbance of the biological balance. The final recommendation is to spray with sulphur in February and again in March, and with the oil/parathion mixture in June and again in July. Toxaphene, Aramite, Ekatin and chlorobenzilate were distinctly less satisfactorily.

5189. JOHNSON, R. B.
How effective is Kepone against citrus rust mite?
Proc. Fla St. hort. Soc., 1960, 1961,**73**: 79-83, and *Citrus Ind.*, 1961, **42**(1): 5-7, 28.

Kepone 50W (a chlorinated aryl hydrocarbon), at 0·5 lb./100 gal. for post-bloom, autumn and winter sprays and at 1 lb./100 gal. for summer sprays, gave control of *Phyllocoptruta oleivora* equal to, or better than, that of zineb, maneb and chlorobenzilate, and far superior to that of sulphur, without injury to fruit or foliage, providing applications were made when the mites first appeared.—Fla Citrus Exp. Stat., Lake Alfred.

5190. Regenass, L.
Red spider mite constitutes a new pest threat in the [Sundays River] Valley.
Citrus Gr, 1960, No. 324, pp. 18-20, 23, illus.

Citrus fruit and foliage injury, characteristics by which the mite (*Tetranychus cinnabarinus*) can be identified, are described, together with control measures, including the use of Kelthane (2 lb./100 gal.), Tedion (1 lb./100 gal.) or for heavy infestations Tedion at 1 lb./100 gal. plus parathion 25% w.p. at 1½ lb./100 gal.—S.A. co-op. Citrus Exch.

5191. Jeppson, L. R., Complin, J. O., and Jesser, M. J.
Red mite population trends on navels in relation to treatment scheduling.
Calif. Citrogr., 1961, **46**: 162-4, bibl. 1.

Over a 5-year period the most effective results of acaricide treatment against *Panonychus citri* were obtained when applications were made in October or November and again in March or April. A third treatment was necessary when mite populations appeared in the summer.

5192. (Jeppson, L. R.)
Citrus red mite.
West. Fruit Gr, 1960, **14**(11): 28, illus.

A device used to test mite reaction to leaf treatments is described. It resembles a roulette wheel with the numbers replaced by citrus leaves which have been given different surface treatments or nutrition. The mites are sprinkled in the centre of the slowly turning disk and their movements towards the leaves observed.—Univ. Calif., Riverside.

5193. Jen, I. S., and Lai, W. C.
A preliminary test on HCN fumigation for the control of several citrus scales and two citrus mites. [Chinese, with English summary ⅓ p.]
Acta ent. sin, 1959, **9**: 21-8, bibl. 8.

All the adult females of the scales *Icerya purchasi*, *Ceroplastes rubens*, *Leucaspis japonica*, *Aspidiotus destructor* and *Pseudococcus citriculus* and the mites *Tetranychus sexmaculatus* and *Paratetranychus citri* were killed by dosages of 10–15 g. NaCN per cu. m. for an hour. Some of the eggs of *I. purchasi* were also killed, but the mite eggs were little affected. Phytotoxic effects appeared on *Citrus unshiu* when the temperature reached 17° C., but the other species treated, *C. succosa*, suffered only slight temporary injury.—Hwang-yen Citrus Exp. Stat. and Plant Quarantine Stat., Chekiang.

5194. Puzzi, D., and Orlando, A.
Experiências de campo para o combate a duas cochonilhas dos citros. **(Field experiments on control of two citrus scales.)**
Biológico, 1961, **27**: 10-12, bibl. 6.

Infestation of orange trees in São Paulo, Brazil, by the circular purple scale (*Chrysomphalus ficus*) was reduced by 90·8–96·5% by the following insecticides: 1% oil, 0·075% malathion, 0·15% dimethoate, 0·15% Gusathion A, and mixtures of 1% oil with 0·0375% malathion or 0·02% diazinon or 0·03% EPN. Comparable results against the purple scale (*Mytilococcus* [*Lepidosaphes*] *beckii*) were obtained with 0·15% Gusathion A and with the above EPN/oil mixture, those with the malathion/oil mixture and with 0·04% diazinon being almost as good.

5195. Georgala, M. B.
Recommendations for the control of red and soft scale.
Citrus Gr, 1960, No. 324, pp. 11-17.

Using parathion for red scale and either Gusathion or parathion plus malathion for soft scale.

5196. Botham, J. R.
Red scale of citrus.
J. Dep. Agric. S. Aust., 1961, **64**: 385-7, 389, illus.

Recommended control measures are a 1 in 50 white oil spray applied in December followed by cyanide fumigation 14 days later.

5197. Hely, P. C., and Gellatley, J. G.
Control of red scale on citrus trees.
Agric. Gaz. N.S.W., 1960, **71**: 580-4, 611, bibl. 2, illus.

By sprays of white oil, alone or with malathion, Trithion, ethion or Gusathion.

5198. Hely, P. C.
Red scale. Yanco tests of mid-February sprays.
Citrus News, 1960, **36**: 127, 139.

Trithion d.p. 0·05% plus white oil 1:100, and dimethoate d.p. 0·1% plus white oil 1:100, gave the best results of 8 insecticides applied as single mid-February sprays. A 2-spray programme is recommended to obtain satisfactory results.

5199. (Edwards, B.)
Red scale recommendations, N.S.W.
Citrus News, 1961, **37**: 14.

New recommendations, which are the result of 4 years' trials, are for a spray of Trithion (1⅔ lb. per 100 gal.) plus white oil (1 in 100) to be applied in February. Heavier infestations need an additional late November–early December spray of white oil (1 in 80) or Trithion alone or the mixture.

5200. Carman, G. E.
Sevin insecticide effective for control of California red scale on non-bearing citrus.
Agric. Chem. Dig., [1960], **2**(4): 1, 8.

Sevin 50% w.p. at 1 to 1½ lb. per 100 gal. gave adequate control of *Aonidiella aurantii*, and even rates as high as 4 lb. per 100 gal. had no adverse effect on orange, lemon and grapefruit trees.—Univ. Calif., Riverside.

5201. DeBach, P., and Landi, J.
Establishment and distribution of wasp parasite of California red scale.
Calif. Agric., 1961, **15**(4): 11-12.
Establishment and progress of a new parasite.
Calif. Citrogr., 1961, **46**: 169, 171-2, bibl. 2.

The life cycle of *Aphytis melinus*, one of a number of natural enemies of California red scale (*Aonidiella aurantii*) that were imported from India and Pakistan, is briefly described. Recoveries indicate that it has taken over from previously established species of *Aphytis* in a number of interior areas, thereby showing that it is better adapted to the environmental conditions and able to produce greater scale mortality. [See also *H.A.*, 31: 3171.]—Univ. Calif., Riverside.

5202. Jolley, L. C.
Preparation for biological control of red scale.
Citrus News, 1960, **36**: 152.

Before changing over to biological control using the wasp *Comperiella bifasciata* it is strongly advised that the scale population be reduced to a low level. On young trees and trees with a red scale history this should be achieved by staggering the annual spray control treatments, so as to harm the existing parasites and predators as little as possible.

5203. Beingolea G., O. D.
El problema de la mosca blanca lanuda de los cítricos en el Peru. **(The citrus woolly white fly problem in Peru.)**
Inf. mens. La Molina, 1960, **34**(390): 1-6, bibl. 22, and *Bol. trim. Exp. agropec. PCEA, Lima*, 1960, **9**(4): 2-8, bibl. 23.

Aleurothrixus floccosus has become more abundant in recent years. The subjects discussed include the only alternate host plant (cape gooseberry, *Physalis peruviana*), symptoms and injuries (sugary excretions, sooty mould, reduced yield), biological enemies (*Encarsia*, *Prospaltella*, *Amitus*, *Eretmocerus* and *Catania* spp.) and chemical control (1–3 gal. light-medium grade emulsifiable oil plus 1–2 lb. 25% parathion w.p. in 100 gal. water or a rotenone-emulsifiable oil mixture).

Citrus—fruit harvesting, packing and storage.

(*See also* 3728, 4005, 5584.)

5204. Spurlock, A. H.
Cost of picking and hauling Florida fruits, 1958-59 season.
Citrus Ind., 1961, **42**(2): 21-2, 24, 26, 34.

Costs of picking (including delivery to the roadside and loading into the truck) and hauling from the grove to the packing house are discussed and compared with those of previous seasons.—Fla agric. Exp. Stat., Gainesville.

5205. Spurlock, A. H., and Hamilton, H. G.
Costs of packing and selling Florida fresh citrus, 58-59 season.
Citrus Ind., 1961, **42**(1): 12, 14, 19-21, 28.

Oranges, grapefruit and tangerines considered separately.

5206. Basson, W. J.
Valencia oranges: when best to harvest this golden crop.
Fmg S. Afr., 1961, **36**(11): 50-1, 55, illus.

The results of an experiment started in 1950 indicate that an out-of-season crop of Valencia oranges should not be allowed to ripen but should be picked green, otherwise the subsequent in-season crop may be much reduced. A time-of-harvesting experiment for in-season Valencias showed the effect of picking season on subsequent crops, and it is recommended that harvesting should be carried out not later than the full-bloom stage. Fairly good results were also obtained by alternate early and late picking.—Citrus subtrop. hort. Res. Stat., Nelspruit.

5207. Coppock, G. E., and Jutras, P. J.
Mechanization of citrus fruit picking.
A.R. Fla agric. Exp. Stats, 1958-59, p. 232.

A mobile picking ladder, a boom-type tree shaker and a boom-type picker's platform were all found to be unsatisfactory. A method whereby oranges above the height of 6 ft. were picked from a picker's platform and those below 6 ft. picked from the ground improved the harvesting rate.

5208. Koenig, K. W., and Rock, R. C.
Latest developments in bulk-field handling.
Calif. Citrogr., 1961, **46**: 130-1, illus.

New pieces of equipment and operational procedures described include a low-bed orchard trailer, a highway straddle-trailer for 24 bins, a boom hoist with a power grapple for lifting the bins, a wheel-mounted boom hoist, a straddle-carrier for 8 bins, a self-loading fork lift, a field fork-lift, pallet bin sweat rooms, a bulk bin dump, an empty bin stacker and several new containers.—Sunkist Grs and Univ. Calif., Riverside.

5209. BIALE, J. B.
Report to the Government of Israel on post-harvest physiology of fruits and vegetables.
Rep. FAO/ETAP **1235**, Rome, 1960, pp. 60, illus.

The report is concerned mainly with a survey of the reasons for deterioration in fruits grown for export, and in those for which there is a potential export trade. Recommendations, both general for all crops and specific for individual crops, are made on orchard practice, harvesting, marketing, storage (both normal and controlled atmosphere) and shipping. The specific proposals are for citrus fruits, avocadoes and bananas.

5210. TINDALE, G. B.
Grapefruit storage temperatures.
Citrus News, 1960, **36**: 121.

Marsh stored below 55° F. developed skin browning and pitting with secondary mould attack.

5211. BRECHET, J.
Essais de conservation sur pomelos et occurrence des maladies spéciales de ces fruits entreposés sous froid. (**Storage trials on grapefruit and the occurrence of certain diseases of these fruits in cold storage.**)
Fruits et Prim., 1960, **30**: 213-15.

Including details of the pitting or pox condition in Marsh Seedless; results of trials at 5 temperatures and 2 humidities are to be published elsewhere.

5212. MOREAU, C., AND MOREAU, M.
Pourritures brunes des agrumes en entrepôts liées à l'état sanitaire des plantations. (**Citrus brown rot in stores as related to the sanitary condition of the plantations.**) [English, German, Spanish and Russian summaries about 14 lines each.]
Fruits d'Outre Mer, 1960, **15**: 478-80, illus.

Examination of oranges and lemons after storage showed that deterioration was due to the presence of species of *Phytophthora* and *Phomopsis*, already present when the fruit was harvested, plus other agents of decay.—Mus. nat. Hist. natur., Paris.

5213. ECKERT, J. W., AND OTHERS.
Controlling *Penicillium* decay of oranges with certain aliphatic amines.
From abstr. in *Phytopathology*, 1961, **51**: 64.

Thirty-five aliphatic amines were evaluated for decay control in oranges artificially inoculated with *P. digitatum*. Applied at the rate of 1 g. per 0·25 cu. ft. of fibreboard carton, 12 amines reduced decay by over 50%. Secondary butylamine, isopropylamine, diisopropylamine, diethylamine, and *t*-butylamine, in order of performance, were most satisfactory in decay control with minimum fruit injury. Paper inserts containing the carbonate, chloride, sulphate, phosphate or acetate salts of isopropylamine, the latter 4 combined with excess Na_2CO_3, controlled decay when applied at the rate of 2 g. isopropylamine equivalent per 1 cu. ft. of fibreboard carton. The activity of amines as volatile fungicides is related to vapour pressure, inherent toxicity and pH at the fruit inoculation site. Amines with high vapour pressure bring about a rapid increase in the pH of fresh fruit wounds that would otherwise be favourable to fungus infection.

Citrus—fruit composition and by-products.

(*See also* 5125, 5134.)

5214. HOROWITZ, R. M., AND GENTILI, B.
Phenolic glycosides of grapefruit: a relation between bitterness and structure.
Arch. Biochem. Biophys., 1961, **92**: 191-2, bibl. 14.

Their chemistry briefly reviewed, with notes on poncirin and phlorin.

5215. TAKATA, S.
Structure of citrus peel and oil extraction.
Perfum. essent. Oil Rec., 1960, **51**: 167-71, bibl. 8, illus.

The anatomy of the peel is described and various methods of extraction outlined. A new machine, consisting of a rotating disk and freely revolving roller, has been found especially suitable for the Japanese mandarin. Its action is described in some detail.—Nippon Flavour Kogyo Ltd., Japan.

5216. SUNKIST GROWERS RESEARCH DIVISION.
The physicochemical properties of California orange and lemon oils.
Perfum. essent. Oil Rec., 1960, **51**: 421-2.

Varietal and seasonal variations in composition are described together with data showing the ranges.

5217. SLATER, C. A.
Citrus essential oils. I. Evaluation of natural and terpeneless lemon oils.
J. Sci. Food Agric., 1961, **12**: 257-64, bibl. 13.

Using a combination of absorption, gas chromatography and infra-red spectroscopy 7 terpenes, 9 sesquiterpenes and 24 oxygenated compounds were isolated from natural lemon oil. The method allows the authenticity of an oil to be assessed, but it does not supersede organoleptic testing.—Schweppes Ltd., The Hyde, London.

5218. SACCO, T.
Ricerche sul *Citrus aurantium* L. della Somalia. (**Studies on sour orange in Somalia.**)
Riv. Agric. subtrop. trop., 1960, **54**: 100-5, bibl. 5, illus.

Description of the species and physical data for essential oils from the leaf and fruit.

Dates.

(*See also* 3618, 5548.)

5219. Breyer, A.
El cultivo del datilero en zonas áridas de la República Argentina. **(Date growing in the arid regions of the Argentine Republic.)**
Rev. agron. Noroeste argent., 1959, **3**: 341-8, illus.

The palms are propagated from suckers planted 9–10 m. apart, production beginning after 6 years and reaching a commercial level after 10 years. Irrigation is practised at intervals of 3 weeks in winter and 6 days in summer, the frequency being substantially reduced during flowering and fruiting. Compost made from goat manure and weeds is used for fertilizing. The young palms need protection from browsing animals and the fruit bunches from birds, wasps, and if low hanging, from foxes. Coarse linen bags exclude birds and wasps. Pests and diseases were unknown in Argentine date palms while imports were prohibited, but suckers subsequently imported from the East under licence may have introduced these. Methyl bromide has given good results as a fruit fumigant. A nutritious flour is prepared from the dried fruit, and attempts are being made to manufacture paper from the stems of male suckers. The economics of date production in Argentina are encouraging.

5220. Ali, S. M.
La palma del dattero in Somalia. **(Date palms in Somalia.)**
Riv. Agric. subtrop. trop., 1960, **54**: 661-5.

Including notes on propagation from suckers and on the 6 varieties grown.

5221. Zimmermann, G.
Moisture determination in dates by forced ventilation infra-red drying.
J. Sci. Food Agric., 1961, **12**: 240-6, bibl. 20,

The method is shown to be highly reliable and reproducible. Heating is for 10 minutes at 50 W and then for 15 minutes at 60 W with a vacuum of 160 mm. mercury and a distance of 30 mm. between the lamp and the 5 g. sample.—Israel Inst. Tech., Haifa.

Litchis.

(*See also* 5261.)

5222. (Hamilton, R. E.)
Litchi: the fruit that goes nutty.
West. Fruit Gr, 1961, **15**(1): 37-8.

Culture, fertilization, propagation, yields and pests of the crop in California briefly described.

5223. Sites, J. W., and Joiner, J. N.
The effects of differential levels of nitrogen, potassium and magnesium on the growth and chemical composition of the lychee (*Litchi chinensis* Sonn.).
A.R. Fla agric. Exp. Stats, 1958-59, pp. 120-1.

Results are given of replicated, greenhouse sand culture and field experiments with litchis. Increasing the N supply increased the N and K contents of the leaves, very slightly depressed K accumulation in the feeder roots, decreased Mg uptake and had no effect on Ca and Na contents. Increasing N drastically suppressed the growth rate, due, it is believed, to the depressive effect of N on K and Mg, thereby causing deficiencies of these 2 elements in the roots. K increased the tissue contents of K, N and P and reduced that of Mg. Increased K also depressed growth, probably by inducing Mg deficiency in the roots. Various levels of Mg had no effect on the tissue content of the other elements supplied nor on the growth rate of the trees. [See also *H.A.*, 29: 4000.]

Olives.

(*See also* 3618, 3921, 3942, 4005, 4339, 5255.)

5224. Breviglieri, N.
La nuova olivicoltura specializzata intensiva. **(The new specialized and intensive cultivation of olives.)**
Ital. agric., 1961, **98**: 215-69, bibl. 20, illus.

This wide-ranging review includes information on: world production of olives between 1947 and 1958 and regional production in Italy in 1959; plans for improving yields from existing plantations; the establishment of new, unmixed plantations with a view to increasing mechanization; the advantages of keeping the tree crowns fairly low and flattened in the direction of the rows, with a tendency to form hedges; the training of palmette and other suitable forms; propagation by cuttings; and pruning for high production.

5225. Anon.
Le olive da tavola in Francia. **(Table olives in France.)**
Inf. Ortofruttic., 1960, **1**: 170-1.

Production figures and brief descriptions of varieties.

5226. Morettini, A.
Selezione clonale del Moraiolo e del Frantoio. **(Clonal selection of the olive varieties Moraiolo and Frantoio.)**
Ital. agric., 1961, **98**: 21-9, bibl. 2, illus.

Type characteristics are described in detail for a selected strain of each variety. Investigations on the modifications of these varietal characteristics caused by soil and climate are in progress, involving 21 possible sub-varieties of Moraiolo and 26 of Frantoio, with a view to their more precise classification.

5227. de la Rocha G., G.
Ensayo de diversos tratamientos en la semilla de olivo. **(A trial of different treatments of olive seed.)**
Inf. mens. La Molina, 1960, **34**(390): 7-10.

Chemical treatments gave the best results in 3 trials designed to improve germination. In the third trial soaking in 0·75% solutions of Na_2CO_3 for 5 hours, NaOH for 6 hours or KOH for 6 hours gave 66, 57 and 44% germination, respectively. Cracking the shell without removing the kernel gave 52% germination. Neither sulphuric acid treatment nor sowing the kernels intact gave good results.

5228. MORETTINI, A.
Il vaso cespugliato, la ricostituzione degli olivi gelati e la nuova olivicoltura intensiva. **(The bushy goblet form for regenerating frost-damaged olive trees, and the new intensive olive cultivation.)**
Ital. agric., 1961, **98**: 141-65, bibl. 23, illus.

The only successful method of regenerating olive trees with obvious or suspected frost damage to the trunks was to cut them down to 10–12 cm. below soil level and encourage suckers to develop from the ovuli by cultivation, manuring and the conservation of soil moisture. Complete regeneration took 3 years, the suckers growing unchecked until the 2nd year when they were reduced to 10 or 12. In the 3rd year those destined for eventual removal were ringed at the base, and finally at the end of that year (or in some instances in the 4th year) they were cut out, leaving 4–5 framework stems for the bushy goblet. With less drastic measures there was some recovery in the first season, but the growth exhausted the reserves, leaving little or no chance of a final resort to the ovuli. Complete trunk removal is also recommended for regenerating very old trees. Where the main branches were injured by frost and the trunk was apparently sound, a copious development of basal suckers after removal of the damaged branches forestalled possible failure of the crown to regenerate. Where the damage was slight enough to be cured by pruning, or involved only defoliation, several treatments with bordeaux mixture prevented wound infection. Among Italian olive varieties, frost resistance decreased in the order: Leccino, Morchiaio, Leccio del Corno, Maurino, Dolce Agogia, Moraiolo, Frantoio. For new plantations the bushy goblet form is considered better than the increasingly popular free palmette. It is common in Spain, and is produced by planting 3 or 4 grafted saplings in a group. The graft union is best placed below soil level for frost protection.

5229. BONNET, P.
Forma de cuidar los retoños y plantones de olivos. **(How to handle olive suckers and transplants.)**
Bol. Oleic. int., 1960, **10**(59): 3-23, illus.

A Spanish translation of a leaflet published by the French Ministry of Agriculture, advising growers on the re-establishment of olive groves severely damaged by frost. The emphasis is on restrained pruning, particularly in the early years. [See also *H.A.*, 30: 2782.]

5230. RENAUD, P.
Régénération d'un verger d'oliviers. **(The regeneration of an olive grove.)**
Paysan du Midi, 13th October, 1960, reprinted in *Oléagineux*, 1961, **16**: 111-15, illus.

Advice on cultivation, nutrition and particularly pruning. [See also *H.A.*, 29: 4004.]

5231. TOMASELLI, R.
Differenziazione delle gemme in alcune cultivar di olivo nell'Ascolano. **(Bud differentiation in some olive varieties of the Ascolana group.)** [English summary ½ p.]
Atti Ist. bot. Univ. Pavia, Ser. 5, 1960, **18**: 108-23, bibl. 23, illus.

Flower bud differentiation began in mid-February in the variety Ascolana tenera, a few days earlier in Lea, and during the 2nd week of March in Carboncella. The first variety, grafted on Carboncella, showed very rapid histological differentiation in the early stages, but the corresponding physiological development was apparently so slow as to postpone maturity, and thus prevent fertilization of the ovules by pollen from the other varieties.

5232. CASINI, E.
Osservazione e ricerche su olivi improduttivi in provincia di Livorno. **(Observations and investigations on unproductive olive trees in Leghorn province.)**
Ann. Fac. Agrar. Pisa, 1958, **19**: 55-136, bibl. 70, illus.

A 2-year investigation led to the following conclusions: *Floral biology:* The Frantoio variety is self-fertile; Moraiolo and Gremignola di Guasticce are self-sterile. *Ring-barking:* When practised in February to a width of 2–4 cm. on branches 3–10 cm. in diameter of vigorous trees with abundant blossom but prior to fruit set, ring-barking gave very large increases in fruit set ranging up to 150%. Fruits were generally smaller and later than on untreated branches. Ring-barking resulted in some defoliation and in pale leaf colour. In the year after treatment branches which had shown good fruit set had a reduced number of flowers but fruit set was again good. *Torsion:* Twisting the basal half of small branches to lacerate and crush the bark had effects similar to ring-barking but did not improve fruit set so much. *Arcure* had little effect on fruit set. *Cincturing* small branches with a strip of zinc wired on in 2 places increased fruit set slightly in the first year and considerably in the second.—Univ. Pisa.

5233. BRADLEY, M. V., GRIGGS, W. H., AND HARTMANN, H. T.
Studies of self- and cross-pollination of olives under varying temperature conditions.
Calif. Agric., 1961, **15**(3): 4-5, illus.

Pollen tube growth, with one exception, was faster in cross-pollinations between Ascolano, Manzanillo and Sevillano olives than in self-pollinations. The exception was Manzanillo pollen on Sevillano pistils. In most of the pollinations warm temperatures favoured compatibility, but when Sevillano pollen was used in cross-pollinations, incompatibility was increased by high temperatures and tube growth was frequently inhibited. Sevillano was the most, and Ascolano the least, self-incompatible.—Univ. Calif., Davis.

5234. CANOVA, A.
Le avversità delle piante viste alla lente. Olivo. (**Plant pests and diseases seen through a lens. Olives.**)
Progr. agric., *Bologna*, 1961, **7**: 96-7, illus.

Brief general notes are given on control measures for the olive moth, the coccid *Euphilippia olivina*, the olive fly [*Dacus oleae*], anthracnose (*Gloeosporium olivarum*), leaf spot (*Cycloconium oleaginum*) and sooty mould [*Capnodium* spp.].

5235. GORTER, G. J. M. A.
The toxicity of some fungicides to conidia of *Gloeosporium fructigenum* f. *chromogenum*.
Tijdschr. PlZiekt., 1961, **67**: 21-4, bibl. 14.

In laboratory tests ferbam proved most effective against the fungus causing olive anthracnose in South Africa. Compared with bordeaux, captan and dichlone were much better, and cuprous oxide slightly better, but copper oxychloride and zineb were less effective.—Dep. Agric., Pretoria.

5236. TOUZEAU, J.
Olivier. Nouvelle mise en point d'une méthode de lutte chimique contre les étourneaux en Tunisie en 1959. (**Recent improvements in a chemical method of controlling starlings in Tunisian olive groves in 1959.**)
Rapp. Activ. Exp. Déf. Cult. 1959, 1960, No. 4, pp. 1-12.

Phosdrin was the most successful product tested, and gas-oil was the best diluent. Recommendations, based on numerous experiments, are to use a minimum of 60 kg. of phosdrin in at least 1,000 l. of liquid per ha. and to begin spraying the olive trees by aircraft 1–1½ hours before the starlings return to roost. The method is not more than 30–40% effective, because the lower branches escape the treatment, and repetition at intervals is therefore necessary.

5237. RICCI, C.
Sound olive processing technique.
Countryman, Nicosia, Nov.-Dec. 1960, pp. 5–7, illus.

Recommendations on picking, transport, storage and oil extraction.

5238. VITAGLIANO, M.
Sopra i costituenti minori dell'olio di oliva. (**The minor constituents of olive oil.**)
Studi Sassaresi, Sez. III, 1959 (issued 1960), **7**: 48-60, bibl. 27.

Analytical data, and the effects of harvesting date and processing on composition.

5239. BAZZI, B.
Determination of residues of O,O-dimethyl S-methylcarbamoylmethyl phosphorodithioate [Rogor] in olives and various vegetable materials.
Publ. Soc. gen. Ind. Min. Chem., *Milano*, 1960, pp. 18, from *Analyt. Abstr.*, 1960, **7**, Abstr. 5480.

5240. DORETTI, M.
Determination of residual diazinon in olive oil.
R.C. Ist. Sup. Sanit., *Rome*, 1960, **23**: 294-300, from *Analyt. Abstr.*, 1960, **7**, Abstr. 5448.

Passion fruit.

(*See also* 5260.)

5241. SIMMONDS, J. H.
Mild strain protection as a means of reducing losses from the Queensland woodiness virus in the passion vine.
Qd J. agric. Sci., 1959, **16**: 371-80, bibl. 10, illus.

In replicated trials, in their second and third years, vines carrying a mild strain of the woodiness virus showed a marked superiority over those carrying a severe strain in number, weight and size of fruit free from woody symptoms. [From author's summary.]

5242. PRUTHI, J. S., AND GIRDHARI, L.
Carbohydrates in passion fruit juice (*Passiflora edulis* Sims.).
Indian J. Hort., 1960, **17**: 133-7, bibl. 14.

Glucose, fructose and sucrose constituted 86·3% of the total carbohydrate content.

5243. PRUTHI, J. S.
Organic acids in passion fruit (*Passiflora edulis* Sims.) juice.
J. sci. industr. Res., India, Sect. B, 1958, **17B**: 238, bibl. 5.

Citric acid formed 93·26–96·22% and malic acid 3·78–6·74% of the total organic acid.

Persimmons.

(*See also* 3937, 3942, 3977, 3981.)

5244. IZAKI, M., ITAKURA, A., AND KASHIMURA, K.
Studies on the reduction of transplanting injury in Japanese persimmon trees. II. Effect of potassium α-naphthaleneacetate on rooting and new shoot growth of transplanted persimmon trees. [Japanese, with English summary $\frac{1}{3}$ p.]
J. hort. Ass. Japan, 1960, **29**: 219-22, bibl. 7, illus.

The roots of 1-year-old persimmon trees were soaked in water for 24 hours (control) or soaked in a solution of α-naphthaleneacetate (0·001–0·05%) for 24 hours, or 1 or 2 applications of α-naphthaleneacetate (0·005–0·01%) were made to the soil after planting. Treatment with growth substance solutions increased shoot and leaf size and the number and weight of new roots, and also induced earlier root development. The effects were more marked with dipping than with soil application and with the higher concentrations of NAA.

5245. TARUTANI, T.
Studies on the utilization of persimmons (*Diospyros kaki* Linn. f.). IV. Effect of some packing materials in cold storage on the fruit quality of the Fuyu variety. [Japanese, with English summary $\frac{3}{4}$ p.]
J. hort. Ass. Japan, 1960, **29**: 212-18, bibl. 16, illus.

Fruit packed in different ways was stored at 0° C. and 85–90% R.H. Packing was in 0·03, 0·06, and 0·08 mm. thick polythene bags, in excelsior in wooden boxes, in rice hulls in wooden boxes, in sealed desiccators, or unpacked as controls. Fruit in polythene bags or the sealed desiccators lost only 1% in weight in 2–3 months compared with the 6–7% lost in the other treatments. The CO_2 content of the atmosphere inside the sealed bags and the desiccator rose quickly, reaching a damaging level in the thickest polythene and in the desiccator after lengthy storage. After-ripening was retarded most effectively by the 0·06 mm. polythene bags. Recommended conditions of storage are 0° C., 100% R.H., 5% CO_2 and 5–8% O_2, and these may be obtained by packing fruit in 0·06 mm. polythene bags. [For parts II and III, see *H.A.*, 31: 3217.]

Pomegranates.

(*See also* 3623.)

5246. OZEROV, G. V., AND OZEROVA, M. A.
The relationship between the water regimes in fruits and leaves. [Russian.]
Fiziol. Rast., 1960, **7**: 600-1, bibl. 2.

The causes of shrivelling and dropping of fruits, especially pomegranates, in the dry sub-tropics were investigated. In laboratory experiments with branches of 4 varieties of pomegranate and 3 of peach it was found that the leaves lost much more water than the fruits and that during conditions of water shortage they were able to withdraw water from the fruits.

5247. LEVIŠKO, P. A.
A simple method for the control of the pomegranate moth. [Russian.]
Zašč. Rast. Vred. Bolez., 1960, **5**(2): 38.

In the Turkmenian S.S.R. *Europhera ligella* causes serious injury to pomegranate fruits, infestation amounting to 20% in some years. Painting the calyxes with clay mixed with DDT or BHC at 10:1 (using DDT for the thin-skinned varieties) in the middle of June or the beginning of July resulted in only 3–8% infestation. Treated fruits were not attacked by the adults, and eggs already deposited were killed. This treatment decreased infestation by 70–80%.

Prickly pears.

5248. BONIFACIO, G.
Il fico d'India: una pianta preziosa per le regioni meridionali. (**The prickly pear: a valuable plant for the southern regions [of Italy].**)
Frutticoltura, 1961, **23**: 49-55, illus.

The prickly pear (*Opuntia ficus indica*) withstands slight frost, but may be killed by more severe frost and injured by salt-laden winds. It has proved an excellent pioneer crop for colonizing sterile volcanic soils for eventual planting with fruit crops. Cuttings, consisting of 2–3 cladodes, are stored for a week to heal the separation scars before planting. The flowers should be removed in the first season of their appearance. On rich soils light pruning may be necessary, and intercropping with peas is practicable during the first few years. Asparagus may be grown indefinitely among the plants. Yellow-, red- and white-fruited varieties are the commonest among those with short, soft spines. A much rarer seedless variety is grown in one locality on Etna, and a spineless variety has been bred. The fruits should be thinned during development and brushed to remove the spines before harvesting. They should be cut and not pulled when harvested, and will keep for many weeks. Fruiting can be induced in midwinter by removing all the flowers produced in the normal season. The fruit pulp contains abundant sugars, essential amino acids and vitamins (especially C), and both flowers and fruit have medicinal properties. The cladodes can be used as fodder.

Tung.

5249. KILBY, W. W., AND OTHERS.
Oil and bordeaux mixtures evaluated in tung leaf spot control studies.
Miss. Fm Res., 1960, **23**(11): 6, 8.

Trials over several years have shown that 5 applications per year of bordeaux, made at intervals of 3 weeks beginning in May, will control *Mycosphaerella aleuritidis*. In 1959 3 applications at intervals of 6 weeks, also starting in May, resulted in fairly satisfactory control. More recent trials with an experimental oil at 2 to 4 gal. per acre have given promising results, and 6 applications per year may be effective.

5250. Chien, T.-Y.
Studies on the bagworm, *Chalia larminati* Heylearts of *Aleurites* spp. [Chinese, with English summary ¼ p.]
Acta ent. sin., 1959, **9**: 224-33, bibl. 7, illus.

Life-history and habits are described. Spraying a wettable powder containing 6% γ-BHC in 300–400 parts of water in June or July gave promising results.

TROPICAL FRUIT AND PLANTATION CROPS.

General.

(*See also* 5559.)

5251. Surinam.
Ondernemingslandbouw in Suriname. **(Plantation agriculture in Surinam.)**
[*Publ.*] *Suriname Dep. Landb.*, 1960, pp. 28, illus.

A review of the development of plantation agriculture, with statistics of recent production.

5252. Kennard, W. C., and Winters, H. F.
Some fruits and nuts for the tropics.
Misc. Publ. U.S. Dep. Agric. **801**, 1960, pp. 135, bibl. 80, illus.

Following brief general notes on the propagation and culture of tropical fruits, over 100 species are described and illustrated, including many of the rarer kinds. The information provided is mostly based on experience gained at Mayagüez Federal Experiment Station, Puerto Rico.

5253. Piringer, A. A.
Photoperiodic responses of tropical horticultural plants.
From summary in *Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960*, 1960, **4** (8th annu. Mtg): 33-4, bibl. 16.

A brief review.

5254. Bachy, A.
Conduite de l'expérimentation agronomique à l'I.R.H.O. **(Agronomic experimental procedure at the I.R.H.O.)**
Oléagineux, 1961, **16**: 75-81, bibl. 1, illus.

Details of standardized methods of lay-out used for field experiments on annual and perennial oil crops.

5255. Prevot, P., and others.
Enquête sur les analyses chimiques de diagnostic foliare réalisées dans huit laboratoires. **(Enquiry into the chemical analyses used for foliar diagnosis purposes in eight laboratories.)**
Oléagineux, 1961, **16**:241-7, and *Agron. trop., Paris*, 1961, **16**: 52-9. [English and Spanish summaries ¼ p. each.]

Analyses on leaf samples of 9 crops, including banana, coffee, hevea, olive and oil palm, were made for N, P, K, Ca and Mg. Details are given of the methods used, and the results obtained are tabulated. In general, the results agreed fairly well, the least uniform being those for Mg. Nevertheless, the small differences were significant. The overall coefficient of variation was 3%. Positive N×P correlations were strongly marked.

5256. Brun, W. A., Cruzado, H. J., and Muzik, T. J.
The chemical defoliation and desiccation of tropical woody plants.
Trop. Agriculture, Trin., 1961, **38**: 69-81, bibl. 3.

Fifty-one formulations were tested on 25 species. Of these 37 acted primarily as defoliants and 13 as desiccants. The most effective defoliants contained either butyne 1,4-diol or tributyl phosphorotrithioite or both, and the best desiccant was tributyl phosphate. Early showers after application did not affect the latter but sometimes reduced the effectiveness of the former.—U.S.D.A., Mayagüez, P.R.

5257. Singh, B.
More unrecorded hosts of *Dendrophthoe falcata* (L.F.) Ettings.
Hort. Advance, 1959, **3**: 131-3, bibl. 5.

Hosts of the "bandha" parasite listed, with intensities of infection.

5258. Cuellar S., R.
Phytonematology in Panama and Central America.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 430-5.

A survey of nematode diseases of coconut, coffee, tomato and tobacco.

5259. Feder, W. A.
The possibilities of biological control of plant-parasitic nematodes in tropical and subtropical areas.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 452-63, bibl. 33.

By endozoic hyphomycetes.

5260. Williams, C. G.
Harvesting and packing tropical fruits.
Pamphl. Qd Dep. Agric. Stock **174**, [1958?], pp. 16, illus.

Methods of harvesting, grading and packing, including the types of case and packing materials used, are described for custard apples, avocadoes, papaws, granadillas and eggplant fruits.

5261. Ghosh, S.
The content of folic acid and its conjugates in some common Indian fruits.
Sci. and Cult., 1960, **26**: 287-8, bibl. 3.
Litchi contained 8·67, green mango 7·26, *Syzigium jambos* 2·95 and *S. cumini* 2·75 γ/100 g.

Areca palms.

5262. Murthy, K. N., and Bavappa, K. V. A.
Breeding in arecanut.
Arecanut J., 1960, **11**: 60-1, bibl. 2, illus.
Because of the heterogeneity of existing palms, selfing for at least 4 generations is considered necessary to obtain reasonably pure strains. Controlled pollination has not been found to improve fruit set.—Cent. Arecanut Res. Stat., Vittal.

5263. Murthy, K. N., and Bavappa, K. V. A.
Floral biology of areca (*Areca catechu* Linn.).
Arecanut J., 1960, **11**: 51-5, bibl. 4, illus.
The development and morphology of the male and female inflorescences are described. The stigma was found to remain receptive for 4–5 days.—Cent. Arecanut Res. Stat., Vittal.

5264. Menon, R.
Yellow leaf disease and mites.
Arecanut J., 1960, **11**: 58-9, bibl. 3, illus.
The differences between fungal disease and mite injury, both of which cause a yellow leaf condition in the areca palm, are described. The condition has been controlled by a Folidol spray (2 c.c. in 1 gal.).—Reg. Arecanut Res. Stat., Palode.

Bananas.

(*See also* 3618, 3725, 5209, 5570, 5577, 5584.)

5265. Jamaica.
Annual Report of the Banana Board Research Department, Jamaica, for 1959, 1960, pp. 39.
Crop physiology: Young buds treated with GA in concentrations from 0·0125–1·25% showed elongations of up to 1 in. in 16 days compared with no elongation in the controls. In a pruning trial the selection of the April and August suckers (12-month pruning technique) gave the greatest number of suckers per mat. Studies continued on the effects of oil spraying, open-handedness and premature yellowing. Dalapon at 5 lb. in 35 gal./acre killed all grasses at all stages of growth and the butoxyethyl ester of 2,4-D at ¾ pt. in 30 gal./acre was equally effective for broad-leaved weeds. Simazine and atrazine showed promise as pre-emergence herbicides. *Analyst:* Studies on leaf analysis are reported. *Agronomy:* A sucker timing experiment showed that for every 500 ft. increase in altitude the time taken by ratoon bananas to shoot increased by approximately 2 months. *Nematology:* The results of a survey of nematodes in banana plantations are reported. *Plant pathology:* High-level aerial oil spraying was effective in controlling leaf spot. There were indications that a high N status reduced the phytotoxic effect of the spray. Lacatan and Robusta proved more susceptible to anthracnose than Gros Michel. Nystatin dips at 100–400 p.p.m. were tested for anthracnose control and gave promising results.

5266. Cerri, P. G.
Alcuni aspetti della tecnica produttiva del banano in Somalia. (**Some aspects of the technique of banana production in Somalia.**)
Riv. Agric. subtrop. trop., 1960, **54**: 535-49, illus.
Spacing, drainage, manuring, causes of bunch deformity and the introduction of new varieties (particularly of the Poyo type) are discussed. The established plantations are of the drought-resistant dwarf variety Giuba of *Musa nana*.

5267. Richardson, D. L.
Note on the reversion of the dwarf banana "Cocos" to "Gros Michel".
Trop. Agriculture, Trin., 1961, **38**: 35-7, illus.
A Cocos plant which produced a tall slender sucker with the morphological features of Gros Michel is reported. The change is thought to be controlled by the somatic loss of the dominant dwarfing allele rather than by reverse gene mutation.—Tela Railroad Co., La Lima, Honduras.

5268. Nunn, W. M.
Water usage trials with bananas on the Gascoyne.
J. Agric. W. Aust., 1960, **1**: 869-71, illus.
Owing to the very dry climate, the freely draining soils and the prolific growth of the banana, the amount of water required is 1½–2 times as much as that used on crops such as lucerne in other districts. Sprinkler irrigation caused sealing of the surface soil. Trials comparing different rates of flooding showed that once the plantation was in production the water usage could be halved without affecting yield.

5269. Murray, D. B.
Shade and fertilizer relations in the banana.
Trop. Agriculture, Trin., 1961, **38**: 123-32, bibl. 6.
Dwarf Cavendish bananas were grown at 4 light intensities ranging from 20% sunlight to full sunlight, with various combinations of N, P and K applied at each intensity plus a foliar spray of NPK (Davegro 0·5%). Leaf counts at 3-month intervals showed no differences due to fertilizer or to the shade treatments up to 6 months, and yields were also unaffected except under the

heaviest shade. A significant correlation was found between the length × breadth of the third leaf at 6 months of age and the final weight of bunch. Shade resulted in increased levels of N, P and K in the leaves.—Imp. Coll. trop. Agric., Trinidad.

5270. Hasselo, H. N.
Premature yellowing of Lacatan bananas.
Trop. Agriculture, Trin., 1961, **38**: 29-34, bibl. 9.

The occurrence of premature yellowing in 8–10-month-old Lacatan bananas was associated with a low leaf content of K, possibly caused by a low K content of the dry soil and by nematode damage to the root system. Figures are given for leaf-K contents and yields derived from a fertilizer experiment.—Cameroons Dev. Corp.

5271. Simmonds, N. W.
Experiments on banana fruit development.
Ann. Bot., Lond., 1960, **24**: 212-22, bibl. 15.

A number of synthetic auxins and auxin-antagonists were applied in lanolin emulsions to young fruits of several edible banana clones and of seeded species, and their effects on fruit development and seed fertility estimated. Auxins stimulated the formation of edible pulp in both seedy and parthenocarpic bananas and induced various degrees of seed sterility. Of the auxin-antagonists tried coumarin stimulated parthenocarpy and induced seed sterility, three others showed little or no activity and thiourea markedly inhibited parthenocarpy. A study of the relationship between size of mature fruit and seed content indicated that developing seeds stimulated the growth of pulp and that the amount of stimulation was roughly proportional to the level of parthenocarpy. [From author's abstract.]—I.C.T.A., Trinidad.

5272. Waite, B. H.
Virus diseases of bananas in Central America. [Spanish summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 26-30, bibl. 7.

Symptoms, spread and insect vectors of infectious chlorosis, mosaic diseases and Roxana disease discussed.

5273. Buddenhagen, I. W.
Bacterial wilt of bananas: history and known distribution.
Trop. Agriculture, Trin., 1961, **38**: 107-21, bibl. 73, illus.

Symptoms, history, known distribution and current status of moko disease, caused by *Pseudomonas solanacearum*, are discussed and the literature is reviewed. Some of the illustrations are in colour.

5274. Guérojt, R.
Le cercospora au Cameroun. Écologie et prévisions. **(Banana leaf spot in Cameroun: ecology and forecasting.)** [English, German, Spanish and Russian summaries about 15 lines each.]
Fruits d'Outre Mer, 1960, **15**: 485-7, bibl. 1.

By the application of forecasting methods worked out in Guadeloupe [see *H.A.*, 28: 3032] control measures have been reduced by 20% without loss of effectiveness.

5275. Riedhart, J. M.
Influence of petroleum oil on photosynthesis of banana leaves.
Trop. Agriculture, Trin., 1961, **38**: 23-7, bibl. 16.

The application of petroleum oil for the control of cercospora leaf spot was found to inhibit photosynthesis, the amount of inhibition depending on the quantity of oil deposited. In experiments in flasks increasing the concentration of carbon dioxide decreased the inhibition. Applications of bordeaux mixture did not affect photosynthesis.—Tela Railroad Co., La Lima, Honduras.

5276. Calpouzos, L., and others.
Some factors in oils affecting their phytotoxicity to banana leaves when sprayed in low volumes.
From summary in *Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960*, 1960, **4** (8th annu. Mtg): 62-3.

Dwarf Cavendish leaves were treated with 4 deposit rates of the aromatic and saturate fractions of an oil used for sigatoka disease control, and the percentage of the leaf area covered with phytotoxic flecks and the disease incidence were noted. The aromatic fraction caused 4 to 61% flecking with increasing deposit rates, and control was good only at the high rates. The saturate fraction caused 26 to 48% flecking with increasing rates, but control was good at all rates.—Fed. Exp. Stat., Mayagüez, P.R.

5277. Wehunt, E. J., and Holdeman, Q. L.
Nematode problems of the banana plant.
Proc. Soil Crop Sci. Soc. Fla, 1959, **19**: 436-42, bibl. 36, illus.

A review of species and control measures.

5278. Colbran, R. C., and Saunders, G. W.
Nematode root-rot of bananas.
Qd agric. J., 1961, **87**: 22-4, illus.

Life history of *Radopholus similis* and its control by hot water treatment of planting material (53–55° C. for 20 min.).

5279. Holmes, N. E.
The harvesting, transport and ripening of bananas.
[*Pap.*] *1st FAO/CCTA. int. Mtg Banana Prod., 1960*, pp. 16, bibl. 27.

Production and export figures are given for the major producing countries, and handling practices are reviewed. The strict control of temperature, which should differ for different varieties, and air circulation are discussed. The usual commercial practice of ripening under controlled temperature and R.H., with or without the addition of ethylene, is described.

5280. Biale, J. B.
The postharvest physiology of bananas.
[*Pap.*] *1st FAO/CCTA int. Mtg Banana Prod., 1960*, pp. 6.

The normal course of ripening is described and its control by maintaining correct temperature, humidity and gaseous exchange is discussed. Ethylene treatment in the ripening room and both common and CA storage are described.

5281. Beccari, F., and others.
Ricerche e prove di lotta contro le crittogame nocive al banano. I–V. **(Studies and tests on the control of fungus diseases of bananas. I–V.** [English summaries.]
Riv. Agric. subtrop. trop., 1959, **53**: 411-27, bibl. 20, illus.; 1960, **54**: 752-62, bibl. 2, and 763-81, bibl. 4, illus.; 1961, **55**: 52-74, bibl. 5, illus., and 75-82, bibl. 2, illus.

Parts I to III: The fungicides Prinzon Cos (a German formulation containing lead) and Basofix BM 117 (a mixture of polyethylene polysulphide, an organic copper compound, clay, a red dye and water) were highly effective against banana anthracnose (*Gloeosporium musarum*). The antibiotic Mycostatin 20 also gave good results, which may possibly be improved in future by using a more suitable solvent. Omadine at 0·1%, although very effective, is not recommended because of its high toxicity and penetrating power.

Parts IV and V: The same products were compared by painting them on the upper and lower cut ends of banana stems before shipment. Prinzon Cos fulfilled the fungicidal promise shown *in vitro*, and apparently did not pass into the fruit, but is as yet too hazardous to be recommended for commercial use. Basofix BM 117 was inferior to Prinzon, except in its better maintenance of stem turgidity and its effect on the contraction and firmness of the cut ends. In a similar experiment, but with bunches halved transversely, Basofix BM 117 was much more effective than Mycostatin 20 applied in 3 times its weight of Latex OMCC522. Injury to the skin and pulp of the fruit did not result in the usual premature ripening and degeneration of the tissue surrounding the wound when Basofix was applied immediately. A delay of 20 min. between cutting and treatment did not appreciably reduce protection, but an 8-hour delay was harmful.—Ist. agron. Oltremare, Firenze.

Cacao.

(*See also* 5329, 5570, 5576, 5587.)

5282. Destrez, J.
Premières recherches sur le cacaoyer à Madagascar. **(Initial cacao research in Madagascar.)** [English and Spanish summaries 13 lines each.]
Agron. trop., Paris, 1960, **15**: 657-60.

The characteristics of the Madagascan cacao growing area are outlined. A research programme was started in 1954, and this article describes some of the early work on selection, propagation by cuttings and culture, including shade.

5283. Lains e Silva, H.
Esboco da carta de aptidão cacauícola de São Tomé e Príncipe. **(A review of the land-use mapping of São Tomé and Príncipe islands with reference to cacao growing.)** [English summary 5 lines.]
Estud. agron., Lisboa, 1960, **1**: 37-43, bibl. 9, illus.

The maps presented and discussed include those for atmospheric pressure, rainfall, soil types, natural vegetation and suitability for cacao planting.

5284. Ciferri, R., and Ciferri, F.
The evolution of cultivated cacao.
Evolution, 1957, **11**: 381-97, bibl. 44, illus.

The outstanding position of Venezuela as a centre of evolution for the best commercial cacaos is emphasized. The taxonomy of the species of *Theobroma* is briefly discussed, including the systematic status of cultivated cacaos. The morphological characteristics of cacao pods and the grading of fresh cacao beans are summarized, and the regions of cacao culture in Venezuela are listed. [From authors' summary.]—Bot. Inst., Pavia.

5285. Grimaldi, J., and Divaret, P.
Contribution à l'étude du bouturage du cacaoyer. **(A contribution to the study of propagating cacao by cuttings.)**
Café, Cacao, Thé, 1960, **4**: 3-15, bibl. 3, illus.

A detailed, well illustrated account is given of successful methods developed in Cameroun. Seasonality in taking cuttings (imposed by the climate) is overcome by selecting early-flushing clones, by reducing shade in the plantations where the selected clones are grown to encourage early bud break, by overhead irrigation and by spraying with urea to stimulate axillary shooting. Unrooted cuttings are transported in plastic bags, 10 per bag in moist wood fibre. Cuttings have 2–4 leaves according to their length, half the blade of each being removed; their bases are dipped in IBA, and they are rooted in sawdust in plastic pots placed in frames with built-in irrigation systems and with the light reduced to 15%. Pricking out is done after 8–10 days when the cutting has formed a callus. Other subjects discussed are the growing-on of the pricked-out cuttings and their transport to growers.—Centre Rech. agron., Nkolbisson, Cameroun.

5286. CONTREIRAS, J. C., AND OTHERS.
Estudos de nutrição mineral e economia de água, relativos a São Tomé, efectuados e projectados pelo Grupo de Fisiologia Vegetal e Radioisótopos das Brigadas de Estudos Agronómicos do Ultramar. **(Studies on mineral nutrition and water relations carried out or projected in São Tomé by the Plant Physiology and Radioactive Isotopes Group of the Department of Agronomic Studies for Overseas Territories.**
Garcia de Orta, 1959, **7**: 821-49, bibl. 41, illus.

Projected investigations on cacao foliar analysis and on urea foliar spraying of cacao grown in sand culture are described.

5287. CARDOSO, A. P. DA S., AND BOROUGHS, H.
Experimentos sobre la absorción foliar y transporte del fósforo-32 en plantas jóvenes de cacao. **(Experiments on foliar absorption and translocation of phosphorus-32 by young cacao plants.)** [English summary $\frac{2}{3}$ p.]
Estud. agron., Lisboa, 1960, **1**: 197-224, bibl. 22.

Foliar absorption and translocation of P^{32} were doubled by adding the anionic wetting agent Fenopon AC-78 to the 0·1 M monosodium phosphate spray. Both were also affected by pH, the highest values occurring between pH 5 and 6, and very low values at pH 7. Leaf necrosis resulted from spraying at 8-day intervals, with or without the wetting agent. Absorption increased rapidly during the second day after application, and was greater from the lower than from the upper leaf surface, but translocation was approximately the same from each. Total translocation continued to increase throughout the 8 days of observation.

5288. CUNNINGHAM, R. K., AND SMITH, R. W.
Comparison of soil covers during cocoa establishment on clear-felled land.
Trop. Agriculture, Trin., 1961, **38**: 13-22, bibl. 15.

The growth of cacao was compared on bare soil, under a *Tripsacum laxum* mulch, with covers of *T. laxum*, *Zebrina pendula*, *Crotalaria striata* and *Stylosanthes gracilis* and with natural regeneration of indigenous species. Best seedling growth was obtained on the plots cover-cropped with *C. striata*, but this legume did not form nodules and died out too quickly, with a consequent loss of organic matter from the soil.—W.A.C.R.I., Tafo.

5289. CUNNINGHAM, R. K., AND BURRIDGE, J. C.
The growth of cacao (*Theobroma cacao*) with and without shade.
Ann. Bot., Lond., 1960, **24**: 458-62, bibl. 7.

Evidence is presented that young plants of cacao can tolerate high light intensities if provided with adequate water and nutrient supplies. [Authors' abstract.] Shade may be helpful in limiting insect damage, in suppressing weeds and in maintaining high air humidity. But, if these factors can be controlled by insecticides, weed-killers and windbreaks, higher production might be obtained without shade. [For related work, see *H.A.*, 29: 1982k.]—W.A.C.R.I., Tafo.

5290. BOUHARMONT, J.
Recherches cytologiques sur la fructification et l'incompatibilité chez *Theobroma cacao* L. **(Cytological investigations on fruiting and incompatibility in cacao.)**
Sér. sci. Inst. nat. Étude agron. Congo **89**, 1960, pp. 117 + 18, bibl. $2\frac{1}{2}$ pp., illus.

Studies on the normal development of the seed and fruit and on the mechanism of incompatibility are described. Self-fertile clones are compatible between themselves and self-sterile clones are incompatible. All the forastero clones examined were self-fertile, whereas self-sterile clones were found amongst the trinitario hybrids. A microscopic method of identifying self-sterile clones, based on the presence of unfused gametes 4 days after self-pollination, is described. Some detailed photomicrographs are provided.

5291. ARCHIBALD, J. F.
Transmission of gall-diseases of cacao, mango, and pigeon pea.
Nature, 1961, **190**: 284, bibl. 4.

Galls similar to the green-point form of cushion-gall in cacao were found on mangoes and pigeon peas. Distilled water washings and extracts of gall tissue from these species were used to inoculate cacao half-beans. Galls, indistinguishable from those produced by inoculations from cacao green-point gall material, were produced in the mango material. In pigeon-pea material similar galls were produced, and sometimes an enlarged and chlorotic axillary bud was also caused.—Bookers Sugar Estates, Ltd., Georgetown, British Guiana.

5292. THRESH, J. M.
Cacao virus research in Nigeria. [Spanish summary $\frac{1}{4}$ p.]
Turrialba, 1960, **10**: 57-63, bibl. 14, illus.

Recent work on mottle leaf, necrosis and swollen shoot is reviewed. For control of swollen shoot the trees with definite symptoms are destroyed, but the radius for destruction of the surrounding suspects has been reduced from 30 yards for all cases to 5, 10 or 15 yards for groups of 1–5, 6–50 and more than 50 infected trees, respectively, without significantly reducing the effectiveness of control for individual outbreaks. Where control of swollen shoot has been abandoned, economic yields may still be obtained if capsids are controlled. Tests are in progress with a view to replacing the swollen-shoot-susceptible amelonado cacaos by varieties which are resistant or at least tolerant. [See also *H.A.*, 30: 6123.]

5293. Hasselo, H. N., and Price, D.
The assessment of black pod disease control in cocoa by mistblowing.
Trop. Agriculture, Trin., 1961, **38**: 133-44, bibl. 8.

The area examined consisted of 500 trees in which black pod disease (*Phytophthora palmivora*) was controlled by applying 3 lb. of copper fungicide in 15 gal. water with a mist-blower. Weekly yield records of individual trees were made. To obtain maximum control of the disease it was necessary to continue spraying during the dry season, when there were no pods on the tree, in order to protect the young leaves. Misting the leafy canopy as well as the pods brought about a considerable increase in yield.—Cameroons Dev. Corp.

5294. Lavabre, E.
Recherches sur une méthode économique de contrôle des mirides du cacaoyer. (**Investigations on an economic method of controlling cacao capsids.**)
Café, Cacao, Thé, 1960, **4**: 16-25, illus.

Periodical dusting of individual trees with BHC and counting the fallen capsids, mostly *Sahlbergella singularis*, showed that, in Cameroun, control treatments (750 c.c. of 16% lindane in 150 l. water per ha.) should be applied in the second half of June, when the population is at its maximum, and again in August.

5295. Wood, G. A. R.
Experiments on cocoa drying in the Cameroons.
Trop. Agriculture, Trin., 1961, **38**: 1-11, bibl. 8, illus.

An oil-fired fan and heat exchanger unit coupled to a simple drying platform, capable of an output of ½–1 ton of dry beans in 20–34 hours, is described. The most economical conditions for operating the dryer are an air temperature of 80° C., a rate of airflow of 8–9 ft./min. and a 5-in. depth of beans. Drying time is influenced by bean size and shell percentage.

5296. Hall, C. W.
Equilibrium moisture content of cacao beans.
[Spanish summary ⅓ p.]
Acta agron., Palmira, 1960, **10**: 53-6, bibl. 3.

Graphs show the equilibrium moisture contents of cacao beans, stored after mucilage removal, for 24 days at 5, 25 and 45° C. and R.H. 16, 56 and 87%. For each R.H. value the moisture content was inversely related to temperature, and at each temperature it was directly related to R.H. The curves show that certain combinations of the 2 factors would make it impossible to dry the beans to the optimal 8% moisture content for storage and processing.

Cashews.

5297. Morton, J. F.
New outlook for the cashew (*Anacardium occidentale*) in tropical America. [Spanish summary ⅛ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 51-7.

The ecology, propagation, culture, harvesting, shelling and processing of cashews are described, together with the industrial uses of cashew nut shell oil. The cashew apple contains 146–372 mg. of vitamin C per 100 g. of edible portion, and of the various products tested chutney and candied cashew apples appear to be the most promising for export.—Univ. Miami, Coral Gables, Fla.

5298. Auckland, A. K.
The influence of seed quality on the early growth of cashew.
Trop. Agriculture, Trin., 1961, **38**: 57-67, bibl. 4.

A sample of unselected cashew nuts was separated into 5 density grades using sugar solutions of differing specific gravities. A study was made of the relationship of density to germination behaviour and the characteristics of the resultant seedlings at various intervals of time after planting. It was found that cashew nuts of a high density grade gave a better germination of seeds, and the resultant seedlings were more vigorous, having thicker stems, more leaves and being taller, than seedlings grown from nuts of a low density grade. Recordings of number of trees flowering and percentages of flowering panicles per tree in the first season of flowering indicated that the trees grown from nuts of high density would be heavier yielding than trees grown from nuts of low density. [Author's summary.]—Minist. nat. Resources, Tanganyika.

5299. Ferreirinha, M. P.
Contribuição para o estudo anatómico da castanha de caju (*Anacardium occidentale* L.). (**A contribution to the anatomical study of the cashew nut.**) [English summary ¼ p.]
Garcia de Orta, 1960, **8**: 295-7, illus.

Particularly pericarp structure.

5300. Pereira, A., Jr., Godinho, L. da S., and Marçal, M. E. E.
Uma nova técnica para a pesquisa da contaminação das sementes de caju (*Anacardium occidentale* L.) pelo bálsamo do respectivo pericarpo. **(A new technique for detecting contamination of cashew seeds by liquid from their pericarps.)** [English summary ½ p.]
Estud. agron., Lisboa, 1960, **1**: 29-36, bibl. 5.
Tests for phenolic constituents of the shell liquid.

Coconuts.

(*See also* 5179, 5258, 5576, 5586, 5587.)

5301. Ceylon.
Annual Report of the Coconut Research Institute for 1959.
Ceylon Coconut Quart., 1959, **10**(3/4): 1-74, illus.
Soil chemistry: The NPK experiment, in its 24th year, continued to show responses only to K; in the manurial × cultivation trial on the other hand responses to P and to ploughing were obtained. Young palms responded to P and K. In a method-of-application experiment responses to N, P and K were obtained, but there were no differences due to method of application. *Chemistry:* Analytical studies on the composition of the apical bud and of seedlings are reported. The oil content of various varieties and changes in the moisture and oil contents of the endosperm during development and germination were also studied. *Botany:* Work reported includes hybridization, especially tall × dwarf, identification of prepotent palms, methods of replanting and planting techniques. First generation tall × dwarf crosses have produced 103 nuts (or 49 lb. copra) per palm in their 9th year. *Agrostology:* Soil studies and grazing trials. *Crop protection:* Red weevil (*Rhynchophorus ferrugineus*) control by injecting Systox into the trunks was very successful but hazardous. The breeding of *Trichospilus pupivora*, a pupal parasite of *Nephantis serinopa*, has been intensified.

5302. Nambiar, M. C., and Upadhya, M. D.
Prestaining treatment and squashing for somatic chromosomes of the coconut palm.
Stain Tech., 1961, **36**: 31-2, bibl. 2, illus.
Detailed procedure using root tips.

5303. Pankajakshan, A. S.
A note on the relative contribution of genetic and environmental factors on the yield of uniformly treated coconut trees.
Indian Coconut J., 1960, **14**: 37-43, bibl. 2.
Statistical examination of the yields over 10 years of a block of 171 trees, which was arranged into plots containing different numbers of palms, showed that the ratio between the genetic and environmental contributions to total variation changed from 3:2 for a 2-year average to 1:1 for 4 years, 2:3 for 6- and 8-year periods and lastly to 1:2 for the 10-year period. Similarly the ratio of the genetic to the environmental component of the within-plots mean square varied from 19:2–3:1 for plot sizes of 2–10 palms at 2 years, to 7:2–4:3 for the same plots over the 10-year period. —Cent. Coconut Res. Stat., Kasaragod.

5304. Manthiriratne, M. A. P. P., and Liyanage, D. V.
Method of artificial pollination of coconut palms.
Ceylon Coconut Plant. Rev., 1960, **1**(2): 3-10, illus.
Recording the date of opening of the spathes on each palm is considered essential. Pollen should be collected 3–8 days after the opening of the inflorescences, by bringing them into the laboratory and standing them with their cut ends in water in a dark box. Pollen may be stored for up to 15 days in a desiccator over 43·4% sulphuric acid, or, after drying, in sealed glass tubes in a deep-freeze for up to 1 year. Female flowers are bagged 3 days before they are expected to be receptive, using cloth bags with clear plastic windows. When the flowers are seen to be receptive, the pollen and a camel hair brush are introduced into the bag through special openings. The equipment required is listed.

5305. Sakai, K.-I.
Studies on selection methods in the coconut palm. [Japanese, with English summary ½ p.]
Bull. Fac. Agric. Tamagawa, 1960, No. 1, pp. 63-71, bibl. 4.
Mass selection is considered preferable to Harland's method of paired crosses [see *H.A.*, 28: 3063].

5306. Thomas, C. A.
A viviparous coconut palm.
Coconut Bull., 1960, **14**: 335-40, bibl. 11, illus.
The seedlings, which are larger than normal, are being grown at the Central Coconut Research Station, Kayangulam.

5307. Santhirasegaram, K., and Ferdinandez, D. E. F.
Studies on the nutrient status of some coconut soils in Ceylon. 3. The forest soil at Ambakelley. (C) The sub-soil.
Ceylon Coconut Quart., 1959, **10**(1/2): 12-20, bibl. 3.
Further studies using *Paspalum commersonii* as a test plant. [For part 3(B), see *H.A.*, 31: 1415.]

5308. Varkey, T., and Davis, T. A.
Studies on coconut pollen with reference to the leaf and root (wilt) diseases.
Indian Coconut J., 1960, **14**: 1-7, bibl. 16.

The inflorescence and pollen morphology are described. Pollen from diseased trees is of irregular and smaller size and shows poorer germination. The percentage of pollen grains germinating from healthy mature palms was found to be 75%, and from healthy young palms 54%. Root (wilt) disease in its early middle and advanced stages reduced the former figure to 52, 49 and 33%, respectively, and leaf (rot) disease in similar stages to 58, 46 and 36%, respectively. Figures for pollen tube growth are also given.—Cent. Coconut Res. Stat., Kayangulam.

5309. MATHEN, K.
Observations on *Stephanitis typicus* Distant, a pest of coconut palm. I. Description and life history.
Indian Coconut J., 1960, **14**: 8-27, bibl. 10, illus.

Suspected of transmitting the virus of root (wilt) disease.

5310. LEVER, R. J. A. W.
Immature nutfall of coconuts.
World Crops, 1961, **13**: 60-2, bibl. 15, illus.

A brief review of work on *Amblypelta* and *Pseudotheraptus* in Melanesia and East Africa.

5311. WHEATLEY, P. E.
Rearing *Pseudotheraptus wayi* Brown (Coreidae) a pest of coconuts in East Africa and evaluation of its susceptibility to various insecticides.
Bull. ent. Res., 1961, **51**: 723-9, bibl. 8.

Bioassays showed dieldrin as likely to be the most suitable insecticide for field use. Gamma-BHC and malathion are considered to be roughly as good as, but DDT inferior to, dieldrin.—Dep. Agric., Kenya.

5312. KIRTHISINGHE, J. K. F.
Red weevil and its control.
Ceylon Coconut Plant. Rev., 1960, **1**(2): 11-25, illus.

The developmental stages of *Rhynchophorus ferrugineus* are described, and the necessity for regular inspection and the avoidance of injury to the palms is stressed. In the apparent absence of biological control, Systox injections have been found effective. Systox should be introduced through a funnel into an oblique hole in the trunk a few inches above the area of infestation. The correct time for treatment is when grubs are found inside the trunks.

5313. NAIDU, G. V. B.
A note on rat control in coconut nurseries.
Mysore agric. J., 1960, **35**: 86-8.

Zinc phosphide baits were effective. Another successful method was to dig a trench around the seedlings and fill this and the whole nursery area with sand 6 in. deep, as rats do not burrow through sand.—Reg. Arecanut Res. Stat., Kyatasandra.

5314. RAO, C. V. N., CHOUDHURY, D., AND BAGCHI, P.
A water-soluble galactomannan from coconut (*Cocos nucifera*).
Canad. J. Chem., 1961, **39**: 375-81, bibl. 40.

A polysaccharide from the kernel containing D-galactose and D-mannose.

Coffee—general.

(*See also* 5576.)

5315. U.S. DEP. AGRIC., FOREIGN AGRICULTURAL SERVICE.
World coffee crop smaller this year.
Foreign Agric. Circ. U.S. Dep. Agric. **FCOF 4-60**, 1960, pp. 14.

1960-61 crop now estimated at 65·2 m. bags, 20% below the 1959-60 record.

5316. DE ARRUDA, H. V.
Aplicação da análise da covariância, num estudo sôbre tamanho de canteiro para experiências com cafeeiros. (**Use of the analysis of covariance for the determination of plot size in coffee trials.**) [English summary 10 lines.]
Bragantia, 1960, **19**: i-v, bibl. 5.

In a fertilizer trial at Ribeirão Preto Research Station plots consisting of 1 line of 5 hills (each with 4 plants) gave results similar to 3-line plots.

5317. SCARANARI, H. J.
Cálculo de custeio de cafèzal. (**Calculating the cost of a coffee plantation.**)
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(403): 11-12.

Annual costs are given for 2 consecutive years of the separate items of soil management, fertilizer application, pest control, frost protection, harvesting, processing, transport and storage for a coffee plantation in São Paulo, Brazil.

5318. DESNEUX, R.
Essai d'adaptation du caféier Robusta à la Station de Kiyaka (Kwango). (**Robusta coffee trials at the Kiyaka Station (Kwango).**)
Bull. Inf. I.N.É.A.C., 1960, **9**: 219-38, illus.

In spite of ecological conditions unfavourable for coffee, robusta was successfully established and can be grown under shade, for example that of oil palms. Problems of pests, diseases and weeds, especially grasses, are mentioned, and details of costs and returns are given.

Coffee—varieties, propagation and planting.

(*See also* 5344.)

5319. CORDIER, L.
Les objectifs de la sélection caféière en Côte d'Ivoire. (**The aims of coffee selection in the Ivory Coast.**)
[*Mimeo. Publ.*] *Inst. franç. Café Cacao*, [1960], pp. 24, bibl. 8.

Descriptions are given of indigenous and introduced varieties of *C. canephora*, including several robustas, and certain other species. Soil, climate and economic aspects of the Ivory Coast and the history of coffee culture there are briefly considered.

5320. Antunes, H., Jr., and Alves, S.
Melhoramento do cafeeiro. XIV. Competição de variedades comerciais em Monte Alegre do Sul. (**Coffee breeding. XIV. Commercial variety trial at Monte Alegre do Sul.** [English summary ¾ p.]
Bragantia, 1960, **19**: 73-89, bibl. 10.

The 4 highest-yielding varieties were Mundo Novo, Bourbon Amarelo, Bourbon Vermelho and Caturra Amarelo. Other data given include the percentages of 1-bean and 3-bean berries, weight per 1,000 beans and tree size. The varieties recommended for this mountainous area are Mundo Novo and Caturra Amarelo, the latter because its low height facilitates harvesting. [For parts XI to XIII, see *H.A.*, 29: 883.]

5321. Wellman, F. L., and Toole, V. K.
Coffee seed germination as affected by species, diseases and temperature. [Spanish summary ⅔ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 1-6.

The seeds of 5 coffee species, which are described, were compared for toughness of shell, times of emergence, germination peaks, diseases, temperature effects upon germination and during storage, and the effects of freezing upon the seedlings.—Univ. P.R., Río Piedras, and U.S.D.A., Beltsville, Md.

5322. Mônaco, L. C.
Efeito das lojas vazias, sôbre o rendimento do café Mundo Novo. (**The effect of empty locules on the yield of Mundo Novo coffee.**) [English summary ½ p.]
Bragantia, 1960, **19**: 1-12, bibl. 8.

Investigations on 4 groups of 5 samples containing 0, 25, 50, 75 and 100% of berries with at least one empty locule showed that: the abortion of one bean had no effect on the weight, density and size of the bean in the other locule; the percentage of one-bean berries (peaberries) decreased as the number of berries without beans increased; the percentage of normal berries increased with an increase in the number of empty berries; yield fell with increasing numbers of empty berries. It is concluded that the selection policy adopted for the elimination of trees producing large numbers of berries with empty locules is effective.

5323. Suárez de Castro, F.
Escogencia y tratamiento de la semilla de café. (**Selection and treatment of coffee seed.**)
Agric. trop., Bogotá, 1960, **16**: 715-24, bibl. 17.

Coffee trees should not be used as sources of seed until they are more than 8 years old. Depulping should be done by hand, or in small hand-operated machines, to avoid damage and mixing of varieties. Fermentation and washing are carried out in the normal way, and defective seeds which float are removed. The seeds are dried in the shade, and those which are small or abnormal are discarded. If it is desired to advance germination by 2–3 weeks, the parchment is carefully removed by hand.

5324. Schmidt, C. B.
Formação de cafèzal. O domínio do café; a lavoura tradicional; a lavoura atual. (**Establishing a coffee plantation. The distribution of coffee; traditional plantations; up-to-date plantations.**)
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(401): 4-8; (402): 4-9; (403): 5-10, bibl. 10, illus.

Planting material, land preparation, establishment.

5325. Borgonovi, M.
Espaçamento para cultura de café. (**Spacing in coffee culture.**)
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(396): 5-8.

On the basis of available soil moisture, spacing in contour planting in São Paulo State should not be less than 3·5 × 2·5 m.

5326. Carvalho, A.
Número de mudas de café por cova. (**Number of coffee plants per planting site.**)
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(396): 9-10, bibl. 1.

In experiments between 1952 and 1957 with planting sites spaced at 40, 60 and 80 cm. apart the average yields of parchment coffee with 1, 2, 3 and 4 plants per site were 378, 551, 762 and 1,046 kg., respectively.

Coffee—climate, growth phenomena and culture.

(*See also* 3724, 3736, 5396, 5560.)

5327. Franco, C. M.
Estrangulamento do caule do cafeeiro, causado pelo frio. (**Strangulation of the stem of coffee caused by cold.**) [English summary 13 lines.]
Bragantia, 1960, **19**: 515-21, bibl. 4, illus.

A constriction with damage to the outer tissues of young coffee stems a few inches above the ground has been observed in severe winters. In laboratory experiments exposure of young stems to a temperature of 0 to —2° C. caused no injury, temperatures below —2° C. caused strangulation and —5 to —7° C. caused death.

5328. Soderholm, P. K., and Gaskins, M. H.
Evaluation of cold resistance in the genus *Coffea*. [Spanish summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 8-15, bibl. 4.

Evaluations of cold resistance are reported for 189 varieties or selections representing 13 species. Field observations were made to assess winter injury, and controlled chilling tests were used to corroborate field results. The plants are divided into four groups on the basis of their resistance to cold. Thirty-three varieties are listed which were not injured in the field by 5½ hours below 35° F., and 4 varieties withstood 29° for 6 hours in the controlled tests. [Authors' summary.]—U.S. Plant Introd. Stat., Miami, Fla.

5329. da Silva, J. V.
Contribution for the study of root system development in coffee tree and cacao tree in some soils in São Tomé. [In English.]
Estud. agron., Lisboa, 1960, **1**: 225-57, illus.

Root systems on different soil types described.

5330. Alvim, P. de T.
Recientes progresos en nuestro conocimiento del arbol de café. 1. Fisiología. **(Recent advances in our knowledge of the coffee tree. 1. Physiology.)**
Reprint from Spanish translation in *Progr. Téc. Prod. Café*, pp. 11-23, of English article in *Coffee Tea Industr. Flav. Field*, 1958, **81**(11), bibl. 50, illus.

Stomatal behaviour, photosynthesis, water relations, growth factors, flowering, fruiting and shade responses.

5331. da Silva, J. B. V., Baptista, J. E., and Nunes, M. A.
Influence of soil moisture content on plant transpiration and application of cobalt chloride paper method to the measure of transpiration of the coffee bush. [Portuguese summary ½ p.]
Estud. agron., Lisboa, 1960, **1**: 271-82, bibl. 17.

Although transpiration in other crops has been shown to depend on soil moisture, an experiment with coffee, using cobalt chloride papers, showed transpiration to be inversely proportional to the relative turgidity of the leaves. As the mean moisture content of the soil was fairly uniform and near the moisture equivalent, it is suggested that differences in transpiration may be used in selecting plants for drought resistance.

5332. Castillo Z., J.
Rendimiento de las variedades typica y bourbon del *C. arabica* L. en diferentes condiciones de cultivo. **(Yields of the typica and bourbon varieties of *Coffea arabica* under different conditions of cultivation.)**
Cenicafé, 1960, **11**: 137-42, bibl. 4.

The proportion (by weight) of pulp to seeds in the berries was slightly higher in bourbon than in typica coffee. It was not significantly altered by shading, which increased both seed weight and berry weight and gave a greater increase in pulp in bourbon than in typica. Fertilizing with NPK produced a greater berry yield increase in typica than in bourbon. The percentage of parchment coffee obtained from the berries was slightly reduced by shading, and was slightly increased by fertilizing unshaded typica and shaded bourbon.

5333. Rao, Y. R. A.
Shade trees for coffee: *Erythrina lithosperma*.
Indian Coffee, 1960, **24**: 500-5, bibl. 18, illus.

Description, propagation, training, diseases, pests and manurial value of dadap.

5334. Tió, M. A., Cibes-Viade, H., and González-Ibáñez, J.
Photosynthetic activity of coffee trees under different intensities of light and nutrition.
From summary in *Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960*, 1960, **4** (8th annu. Mtg): 7.

The photosynthetic activity of trees, submitted to 5 different levels of light and 4 concentrations of N, P and K in each light treatment, was determined by measuring the CO_2 fixation of attached leaves. The leaves were enclosed in a transparent chamber of Nitron, and the CO_2 concentration of the air measured before and after entering the chamber by means of an infra-red gas analyser. Leaves on the periphery of the trees as well as those in the interior were measured. The results indicated that apparently there is an optimum level of light intensity at which the photosynthetic mechanism of the coffee tree is most efficient. There are also indications of a direct relationship between nutrition and photosynthetic efficiency.—Univ. P.R., Río Piedras.

5335. Uribe H., A.
Herbicidas en cafetales sin sombra. **(Herbicides in unshaded coffee plantations.)**
Cenicafé, 1960, **11**: 101-19, bibl. 11.

Pentachlorophenol at 15%, mixed with TCA at 3 or 6%, using 500 l. of water per ha., gave the most thorough control of weeds and, with 6% TCA, increased yields. With 3% TCA the yield was inexplicably reduced by 48·3% below that of the hand-weeded control plot. A mixture of 0·8% 2,4-D and 2% dalapon increased the yield by 45·6%. The most persistent weeds were *Paspalum tenellum*, *P. conjugatum*, and *Marsypianthes chamaedrys*. In areas where the soil is subject to erosion by heavy rain, it is advisable to use herbicides which do not completely denude the soil of weed cover. The creeping weed *M. chamaedrys*, which resists the 2,4-D–dalapon mixture, is relatively non-competitive with the crop and is a safeguard against erosion.

5336. Carvajal, J. F.
Estudio preliminar sobre la respuesta del cafeto al ácido giberélico. **(Preliminary studies on the response of coffee seedlings to gibberellic acid.)** [English summary.]
Rev. Biol. trop., 1958, **6**: 273-8, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 42465.

Applications of GA significantly increased the height growth of arabica seedlings, there being a linear relationship between GA concentration and growth increase. Stem diameters did not appear to be affected. In another test seedlings receiving monthly applications of GA made better growth than those receiving bi-monthly applications. Plants treated with 40 and 50 μg. GA at each monthly application grew excessively and developed abnormally narrow leaves.—Ciudad Univ., San José, Costa Rica.

5337. Figueroa, R.
Aplicaciones foliares de sucrosa uniformemente marcada con C^{14} en plantas de café. (*Coffea arabica* L.) **(Foliar applications of sucrose uniformly labelled with C^{14} to arabica coffee plants.)**
Bol. trim. Exp. agropec. P.C.E.A., Lima, 1960, **9**(2): 2-7, bibl. 15.

A labelled 3% sucrose solution was applied to one leaf of the second youngest pair on young coffee plants growing in sand culture in the greenhouse. Absorption of the sucrose was reduced, but its translocation was increased, by the addition of a wetting agent. Absorption was greater by night than by day, and through the lower than through the upper surface of the leaf.

5338. Franco, C. M., and others.
Manutenção de cafèzal com adubação exclusivamente mineral. **(The maintenance of a coffee plantation with exclusively mineral fertilization.)** [English summary ½ p.]
Bragantia, 1960, **19**: 523-46, bibl. 29.

In a 5-year trial in a 40-year-old bourbon vermelho (*C. arabica* var. *typica*) plantation growing on terra-roxa soil and yielding 24 bags of dried cherry per 1,000 trees per annum, the treatments were mineral N, P and K each at 3 rates, micro-nutrients (Zn plus Cu plus B) and green manure (*Glycine max* or *Canavalia ensiformis*). N gave large yield increases, partly because the rates, 120 and 360 g. N per tree, were high, but chiefly because it was applied in 3–4 equal doses at 2-month intervals. Yield was 9% higher with the high K rate of 240 g. K_2O per tree than with the low rate of 120 g. Neither P nor green manure had any effect. The micro-nutrient spray caused Zn deficiency symptoms to disappear but reduced yield for some undetermined cause not connected with B toxicity. N improved foliage colour and development.

5339. Godoy, C., Jr.
Forçamento de mudas de café. III. Efeito de adubos isolados. **(Forcing coffee seedlings. III. The effect of single-salt fertilizers.)**
Rev. Agric., Piracicaba, 1960, **35**: 290-7, bibl. 10.

Coffee seedlings were sprayed with ammonium phosphate, potassium nitrate, urea or a mixture of all three substances. Except for potassium nitrate the treatments increased the number of leaves beyond that of the controls. All the treatments increased plant height, fresh and dry weight, and the urea significantly increased root dry weight. Urea alone at 0·1% was toxic to the leaves, probably owing to biuret impurity, but this action was not manifested by the mixture. [For part II, see *H.A.*, 30: 2879.]

5340. Malavolta, E., and others.
Estudos sôbre a alimentação mineral do cafeeiro. II, III, IV. **(Studies on the mineral nutrition of coffee. II, III and IV.)** [English summaries totalling 2½ pp.]
(II) *An. Esc. sup. Agric. Queiroz*, 1959, **16**: 101-11, bibl. 4; (III) *Rev. Agric., Piracicaba*, 1960, **35**: 273-89, bibl. 23; (IV) *Rev. Café portug.*, 1960, **7**(27): 5-12, bibl. 12, and *Rev. Agric., Piracicaba*, 1960, **35**: 328-37, bibl. 12.

Part II: On a mixed terra roxa soil high in P-fixing capacity, the percentages of coffee leaf-P derived from labelled superphosphate were 1·7 from placement in a semi-circular furrow round the trunk, 2·4 from a circular furrow, 10·2 from a top-dressed circular strip and 38·0 from a foliar spray. Further tests confirmed that sprayed P was absorbed and translocated by the leaf.

Part III has already been abstracted from another source [see *H.A.*, 31: 3321].

Part IV: An excess of any of the elements N, P, K, Ca, Mg or S decreased the dry weights of coffee leaves and stems, and, with the exception of Ca and S, decreased root dry weight. Excess of P, K or S produced toxicity symptoms [not specified]. The composition of the upper and lower leaves is tabulated to show the effects of each excess. [For part I, see *H.A.*, 29: 888.]

5341. Malavolta, E., and others.
Tracer studies in the coffee plant (*Coffea arabica* L.). [In English.]
An Esc. sup. Agric. Queiroz, 1959, **16**: 65-78, bibl. 10.

Young coffee plants growing in nutrient solutions were supplied with radioactive Zn either via the roots or as a foliar spray. The quantity absorbed by the leaves was 8 times as high as by the roots, whose activity in this respect was markedly reduced by the addition of Mn, Cu or Mo to the solution, but was unaffected by Fe. In pot experiments the plants recovered only 0·1% of the Zn applied to a sandy soil and 0·2% of that applied to a heavy (terra roxa) soil. In an experiment with urea containing C^{14} foliar absorption of this fertilizer reached 95% within 9 hours of application. Data on the metabolizing of the absorbed urea in the coffee leaves are discussed.

Coffee—disorders, diseases and pests.

(*See also* 3752, 5258, 5356.)

5342. Wormer, T. M., and Firman, I. D.
Crinkle-leaf and hot and cold symptoms of coffee in Kenya.
Kenya Coffee, 1961, **26**: 13-17, bibl. 3, illus.

The similar but not identical symptoms of these 2 diseases are described and illustrated. For crinkle-leaf shade is recommended, and good control has been reported through the use of captan sprays. Shade is also recommended for the hot and cold condition, which, however, is only serious in association with debility and unsuitable environments.—Coffee Res. Stat., Ruiru.

5343. Costa, A. S., and da Silva, D. M.
Estudos sôbre a mancha aureolada do cafeeiro. (**Studies on coffee halo blight.**) [English summary 17 lines.]
Bragantia, 1960, lxiii-lxviii, illus.

Two antibiotics and 13 fungicides, sprayed every 5 days from 20 March to 25 July, all failed to give satisfactory control of halo blight on *C. arabica*. Treatments designed to improve nutritional status, e.g. fertilization and minor-element application, were also ineffective.

5344. d'Oliveira, B., and Rodrigues, C. J., Jr.
I. A survey of the problem of coffee rusts. II. Screening for resistance to *Hemileia vastatrix* on *Coffea arabica*.
[*Mimeo. Publs*] *Junta Export. Café, Lisboa*, 1960, pp. 68 and 46, bibl. (I) 26.

The first paper reviews work undertaken by the Coffee Rust Research Centre in Portugal, in collaboration with the U.S. Department of Agriculture, on the physiological specialization of the rusts *H. coffeicola* and *H. vastatrix* and on the grouping of coffees according to their reaction to these fungi. The genetics of resistance is also discussed. The second paper, by the second author only, provides a table of 1,195 coffee selections or cultivars showing their origin and reaction group.

5345. Ananth, K. C., and Chokkanna, N. G.
A contribution to the knowledge of spore dispersal of *Hemileia vastatrix* by certain species of thrips occurring in *Coffea arabica* in South India.
Indian Coffee, 1961, **25**: 37-8, bibl. 5, illus.

5346. Raj, T. R. N., and George, K. V.
A note on bordeaux toxicity in coffee seedlings.
Indian Coffee, 1960, **24**: 452-3, bibl. 2.

The percentages of seedlings showing root malformation when grown in beds drenched with bordeaux mixture at 2%, 1% and 0·5% were 85, 55 and 40, respectively. Tap root growth was also reduced in proportion to the strength of the bordeaux drench.—Coffee Res. Stat., Mysore.

5347. de Arruda, H. V.
Efeito depressivo de nematóides, sôbre mudas de cafeeiro formada em laminados. (**The stunting effect of nematodes on coffee seedlings raised in boxes.**) [English summary 8 lines.]
Bragantia, 1960, **19**: xv-xvii, illus.

Coffee seedlings raised in soil inoculated with *Meloidogyne exigua* shortly after the seed was sown averaged 19·1 cm. in height when 6 months old compared with 24·9 cm. in the uninoculated controls.

5348. Carvalho, J. C.
Nova espécie de nematóide parasita do cafeeiro. (**A new species of nematode parasitic on coffee.**)
Biológico, 1960, **26**: 226-8, bibl. 1, illus.

Gall-like swellings on the roots of coffee in northern Paraná, Brazil, were caused by a new nematode species, *Meloidogyne coffeicola*. Systemic chemicals such as Systox, applied at concentrations safe for coffee, did not control the pest. Apart from sacrificing all the affected plants, the only practicable control method appears to be soil fumigation. If serious infestation necessitates large-scale crop destruction, *Panicum melinis* is considered a good crop to sow before replanting with coffee.

5349. Calil, J.
Combate às principais pragas do cafeeiro. (**Control of the chief pests of coffee.**)
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(402): 10-12.

Brief notes are given on the chemical control of coffee berry borers, brown scales, white scales, green scales, root scales [mealybugs?], waxy scales (*Cerococcus catenarius*), leaf miners, snails and red mites.

5350. Crowe, T. J.
Mites as coffee pests.
Kenya Coffee, 1960, **25**: 504-5, bibl. 3, illus.

The yellow tea-mite (*Hemitarsonemus latus*), the red spider mite (*Oligonychus coffeae*), the red crevice mite (*Brevipalpus phoenicis*) and the yellow coffee mite (*Diptilomiopus* sp.) have been observed on coffee in Kenya and are described. Infestations have not yet been severe enough to necessitate control measures.

5351. Gallo, D., and Rocha, J. de M.
O bicho mineiro do cafeeiro. **(The coffee leaf miner.)**
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(397): 9-11, and *São Paulo Agrícola*, 1960, **2**(15): 6-8.

In a trial for the control of *Perileucoptera coffeella* the best results were obtained with 0·15% Bayer 4895 at 9·2 l. per block of 9 trees and 0·25% Bayer 4970 at 7·5 l. per block, both of which gave 100% control after 48 and after 96 hours. Folidol 0·1% at 5·5 l. per block gave 99 and 100% control after 48 and 96 hours. A sticker was used.

5352. Lavabre, E.
Contribution à la connaissance du *Xyleborus morstatti* Haged., scolyte des rameaux du caféier robusta. **(A contribution to the knowledge of *Xyleborus morstatti*, a scolytid pest of robusta coffee branches.)**
[*Mimeo. Publ.*] *Inst. franç. Café Cacao*, [1960] pp. 9, bibl. 1.

Graphs showing fluctuations in the infestation of coffee by *X. morstatti* in the lower Ivory Coast and French Cameroun were analogous to those for major element uptake by the plants as established by Loué [see *H.A.*, 30: 6158]. Both showed minima from January to March, i.e. in the main dry season. Thus the widely held opinion that the pest can be controlled by increasing the supply of nutrients to the crop is untenable. [See also *H.A.*, 30: 2893.]

5353. Pigatti, A., and Pereira, J., Jr.
Pesquisas sôbre alternação do gôsto da bebida de café colhido em plantas tratadas com BHC. **(Investigations on flavour deterioration in coffee harvested from trees treated with BHC.)** [English summary 9 lines.]
Biológico, 1960, **26**: 206-9, bibl. 5.

Berries were harvested green, ripe, over-ripe and shrivelled, from trees treated with different quantities of BHC and from untreated controls in several localities. Tasting tests of the resulting beverages showed no instances of BHC having produced an off-flavour sufficient to affect the commercial grading, but in every case the flavour corresponded to the degree of ripeness.

Coffee—processing and composition.

(*See also* 5572.)

5354. Franco, C. M.
A eliminação da substância péctica do café despolpado é causada por microrganismos. **(Micro-organisms destroy the pectic matter of depulped coffee beans.)** [English summary 16 lines.]
Bragantia, 1960, **19**: 621-6, bibl. 13.

Treatment of depulped bourbon vermelho (*C. arabica*) beans with a solution of $Ca(OH)_2$ and/or 0·4% NaCl hardened the enveloping pectic matter, but when the beans were subsequently washed and placed in water the pectic matter became turgid again. It is considered that these results show that the pectic matter is not destroyed by enzymes contained in the bean, as has been suggested [*H.A.*, 28: 1891 and earlier], but by micro-organisms.

5355. Esteves, A. B.
Travaux en cours sur le grain de café vert portugais. **(Investigations in progress on Portuguese green coffee beans.)**
[*Mimeo. Publ.*] *Junta Export. Café, Lisboa*, 1960, pp. 9, bibl. 8.

A brief discussion of the programme of physical, chemical, technological and phyto-sanitary studies on Angola coffees.

5356. Subrahmanyan, V., and others.
Storage of coffee beans.
Indian Coffee, 1961, **25**: 26-36, bibl. 2, illus.

The influence of the moisture content of the bean and of temperature on quality are discussed and various types of storage, including bulk storage and storage in jute and polythene containers, described. The effect of the monsoon, when the moisture content of the stored beans rises, on fungal and insect pests is considered, and control measures are outlined for use in warehouses. The costs of polythene balloon storage are tabulated.—Cent. Food tech. Res. Inst., Mysore.

5357. Sondheimer, E., Szymanski, C. D., and Corse, J. W.
Isolation of chlorogenic acid and its isomers from coffee.
J. agric. Food Chem., 1961, **9**: 146-9, bibl. 13.

A method is described for the isolation of isochlorogenic, chlorogenic and neochlorogenic acids and another isomer from coffee beans. The yield from 1 kg. of beans was 15·5 g. isochlorogenic acid, 12·4 g. chlorogenic acid, 1·03 g. neochlorogenic acid and 1·15 g. of the other isomer.—Syracuse Univ., N.Y., and U.S.D.A., Albany 10, Calif.

Guavas.

(*See also* 5584.)

5358. Dedolph, R. R., and Bowers, F. A. I.
Studies on guava propagation.
Hawaii Fm Sci., 1960, **9**(2): 4-5, illus.

A hundred 6-year-old trees were top-worked in various ways, viz. by bark grafts with and without a nurse branch, by side-wedged grafts on stump shoots arising after all branches were removed, and by patch budding on stump shoots arising from stumps with and without a nurse branch. Patch budding on stump shoots $\frac{1}{2}$–$\frac{3}{4}$ in. in diameter proved the most successful. A nurse branch left on the stump increased the rate of growth of a stump shoot, thus decreasing the time needed to grow a shoot large enough for budding, and also tended to reduce undesirable suckering. The process is well illustrated.

5359. SETH, J. N.
Causes of seedlessness in *Psidium guajava* L.
Hort. Advance, 1959, **3**: 82-7, bibl. 22, illus.

In the variety Seedless both pollen and embryo sacs were found to be functional, but the percentage of viable pollen grains is low and the development of the tube is inhibited in the style. This variety is a diploid, but abnormal meiosis and non-uniform pollen grains show it to be hybrid in origin.—Hort. Res. Inst., Saharanpur.

5360. RANGASWAMI, G., AND KALIAPERUMAL, T. T.
The presence of indole-like compounds in parthenocarpic guava.
Curr. Sci., 1960, **29**: 485-6, bibl. 2, illus.

Treatment of emasculated flowers of the variety Allahabad Round with water and ether extracts of pollen, NAA, NOA and 2,4-D produced parthenocarpic fruits. Chemical analysis showed traces of an indole-like compound in pollen collected immediately after the opening of the flowers and in ovaries collected 5 days after selfing.—Annamalai Univ., Annamalainagar.

5361. ACCORSI, W. R., AND OTHERS.
Sintomas externos (morfológicos) e internos (anatómicos) observados em folhas de goiabeira (*Psidium guajava* L.) de plantas cultivadas em solução nutritiva com carência dos macronutrientes. **(Morphological and anatomical symptoms observed in leaves of guava from plants grown in nutrient solutions deficient in major nutrients.)**
Estud. agron., Lisboa, 1960, **1**: 83-92, bibl. 4.

Deficiency chlorosis in guava leaves was uniform for N, interveinal for Mg and mottled for S. The main veins turned purple when S was deficient, and the interveinal tissues, starting at the margins, when P was deficient. Brownish red patches appeared in K deficiency and scorched margins in Ca deficiency. In most instances the nutritional deficiencies caused deformity and agglutination, as well as discoloration, of the chloroplasts.—Univ. S. Paulo, Piracicaba, Brazil.

5362. LANDGRAF, H.
Óleo de semente de fruto de goiabeira (*Psidium guajava*). **(Guava seed oil.)**
Rev. Agric., Piracicaba, 1960, **35**: 179-81, bibl. 5.

The seeds of white guavas had an oil content of 9·4% and those of yellow guavas 7·4%. Analyses of the oils are given.

Mangoes.

(*See also* 3618, 3752, 5117, 5261, 5291, 5584.)

5363. STEPHENS, S. E.
Mango growing in Queensland.
Qd agric. J., 1960, **86**: 761-6, illus.

Varieties, climatic and soil requirements, propagation including bud grafting and in-arching, cultural practices, pruning, fertilization and harvesting.

5364. ROY, R. S., AND SHARMA, C.
Mutation in mango (*Mangifera indica* L.).
Indian J. Hort., 1960, **17**: 142-3, bibl. 4, illus.

A bud sport in a grafted tree of the variety Hirasonia described.

5365. SIMÃO, S.
O uso de sementes da frutos verdes de manga para porta enxêrto. **(Seeds of green mangoes for rootstock production.)**
Rev. Agric., Piracicaba, 1960, **35**: 183-8, bibl. 2.

Mango seeds of 2 varieties from under-developed, but mature windfall fruits were sown on 25 November, (1) as husked kernels, (2) with the husk cut lightly near the stalk, and (3) as unhusked seeds. In both varieties germination began earlier and was much greater with kernels only. For example, with Espadinha the germination after 3 weeks was 51%, 5% and nil, respectively, in mid-December, and 77%, 52% and 36%, respectively, in early February.

5366. SERPA, D.
Semilleros de mango. **(Mango seed.)**
Agric. venezol., 1960, **24**(218): 14-15, illus.

Mango kernels sown with the concave edge facing downwards began to germinate in 7–14 days and could be grafted after 6 months.

5367. MOREZ, H.
Le néburon dans le traitement des pépinières arbustives tropicales. **(Neburon treatment of tropical fruit tree nurseries.)** [English, German, Spanish and Russian summaries about 11 lines each.]
Fruits d'Outre Mer, 1960, **15**: 488-90, illus.

Neburon (Karmex N) at 15, 20 and 25 kg./ha. gave effective weed control in mango and sour orange nurseries when it was applied to bare soil, but not when the land was already weedy. Well-lignified nursery plants were not damaged.

5368. SINGH, L. B.
Movement of flowering substances in the mango (*Mangifera indica* L.) leaves.
Hort. Advance, 1959, **3**: 20-7, bibl. 9, illus.

Fifteen potted seedling rootstocks each of Langra (biennial bearer) and Totapari Red Small (regular bearer) were approach-grafted to two 30-year-old trees of these varieties. Six treatments were compared, viz. (1) scion shoot girdled below the union and stock seedling headed back above the union, (2) scion girdled below the union and the stock seedling left intact, (3) scion girdled below the union and stock seedling defoliated and then left intact, (4) stock and scion both girdled below the union and the stock seedling left intact, (5) seedling stock cut from below the union and the tree shoot cut above the union, so that the tree might act as the stock and the seedling as the scion, (6) seedling stocks grafted without further treatment to act as controls. It was found that the flowering hormone travels from the scion branch to the seedling stock in either direction, and that the seedling stock can initiate flowers in the absence of leaves but not when leaves are present. The flowering response in seedling stocks bore no relation to the fruiting habit of the variety. Thus seedlings can be made to flower and fruit, if they are approach-grafted to a comparable shoot on a bearing tree and are then defoliated and the scion shoot ringed below the union. The bearing habits of seedling hybrids may be tested using this technique.—Hort. Res. Inst., Saharanpur.

5369. Singh, R. N.
Studies in the differentiation and development of fruit buds in mango (*Mangifera indica* L.) varieties. III. Mango shoots and fruit-bud differentiation.
Hort. Advance, 1959, **3**: 28-49, bibl. 8, illus.

In the regular bearing varieties and also in the variety Baramasi, which has no set fruiting habit and differs from other varieties, shoots generally extend every year, and such shoots differentiate flower buds whether the cessation of growth is early or late in the season. Similarly, unextended shoots are equally capable of forming flower buds. In the biennial bearing varieties Dashehari and Langra both the extended and unextended shoots form flower buds when it is an on-year, but in the off-year there is no flower-bud differentiation in either type of shoot. There appears to be no relationship between the length, girth and number of leaves per shoot and flower-bud differentiation, and it seems that, when flower initiation is stimulated, flower buds can differentiate and develop from any point on the tree, irrespective of the size and nature of the shoots. [For parts I and II, see *H.A.*, 30: 2914.]—Hort. Res. Inst., Saharanpur.

5370. Singh, L. B.
Biennial bearing in mango as related to the chemical composition of shoots.
Hort. Advance, 1959, **3**: 50-75, bibl. 10.

Chemical analyses of the shoots of 4 varieties were made over a 9-month period, but the contents of minerals were apparently unrelated to the biennial bearing habit. In a further experiment on 2 varieties CaO, MgO, N and P_2O_5 were found to be generally higher in bearing shoots than in non-bearing shoots.—Hort. Res. Inst., Saharanpur.

5371. Plenet, A.
La lutte contre les principaux ennemis du manguier à la Réunion. **(Control of the principal enemies of mango in Réunion.)**
Rev. agric. Réunion, 1960, **60**: 267-78, bibl. 9, illus.

The biology and control are discussed of the cecidomyid *Procontarinia matteiana*, the fruit fly *Ceratitis capitata*, the longicorn beetles *Batocera rubus* and *Coelosterna scabrata* and the principal fungal diseases, namely anthracnose (*Colletotrichum gloeosporioides*), powdery mildew (*Oidium* sp.) and sooty mould.

5372. Viégas, A. P.
Seca da mangueira. (**Mango blight.**) [English summary 10 lines.]
Bragantia, 1960, **19**: 163-82, bibl. 15, illus.

Mango blight, a serious disease in N. and N.E. Brazil, in which the young shoots wither, is caused by *Ceratostomella fimbriata* in association with the borer *Hypothenemus plumeriae*. Control is by removal of dead branches, painting wounds with bordeaux mixture, destroying diseased trees including the fallen leaves and the application of BHC or DDT and a fungicide.

5373. Singh, S. M.
Studies on mango shoot-gall in the Tarai region of Uttar Pradesh, its cause and control. I. Review of work.
Hort. Advance, 1959, **3**: 89-94, bibl. 41.

Biology and control of *Apsylla cistellata* and other psyllids.

5374. Mukerjee, P. K.
Biochemical and physiological studies during development of mango fruit.
Hort. Advance, 1959, **3**: 95-101, bibl. 6.

Changes in weight, acidity, sugar and starch contents during growth are described. Starch content and specific gravity may prove useful in determining the best time for picking.—Hort. Res. Stat., Saharanpur.

5375. Popenoe, J.
Determinación de madurez en los mangos. (**Determination of maturity in mangoes.**) [English summary $\frac{1}{4}$ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 31-2, bibl. 5.

The use of specific gravity has certain advantages: data are given for Haden mangoes. [See also *H.A.*, 29: 900.]

5376. Date, W. B., and Mathur, P. B.
Effect of post-harvest treatment with growth regulators on the ripening of mangoes (*Mangifera indica* L.).
Hort. Advance, 1959, **3**: 108-10, bibl. 4.

Mature fruits were dipped in solutions of 2,4,5-T and MH40 at 1,000 and 1,500 p.p.m. and stored at room temperature for 10 days. Skin colour changes were retarded, especially by 2,4,5-T, but MH40 caused undesirable off-flavours. 2,4,5-T at 1,000 p.p.m. showed the most promise of extending storage life.—Cent. Food tech. Res. Inst., Mysore.

5377. Ross, E.
Present and future of mango processing.
Hawaii Fm Sci., 1960, 9(2): 3, bibl. 3, illus.

Freezing and canning have proved the best processes for preserving the organoleptic and vitamin qualities of mangoes, but both processes are limited by labour and other costs. The preparation of mango nectar, chutney and dried mango is reported.

Oil palms.

(*See also* 5560, 5576.)

5378. W.A.I.F.O.R.
Eighth Annual Report of the West African Institute for Oil Palm Research 1959-60, 1960, pp. 144, 2s. 6d.

The research work of the Institute is described in Part II of the report. *Agronomy:* Marked responses were obtained from the application of N to prenursery seedlings, ammonium phosphate being superior to the sulphate. Inter-cropping with cassava continued to prove beneficial, particularly with an NPK dressing, but, whereas oil palms also benefited from association with robusta coffee in a mixed stand, the coffee seemed to grow better by itself. The striking responses to K obtained at 2 sites were maintained in 1959, and at one site a significant increase of yield due to P application was recorded. *Plant nutrition:* The study of deficiency symptoms and the collection of leaf samples for analysis continued. The analytical methods used for the determination of N, P, K, Mg and Ca are given. *Plant pathology:* Ziram, phaltan and Cuman all caused highly significant reductions in *Cercospora* infection, and it was noted that K fertilization also reduced its incidence. Blast disease was substantially reduced by August and September irrigation. The pathogen of dry basal rot has been identified as *Ceratocystis* (*Thielaviopsis*) *paradoxa*.

5379. Bocquet, M., and Michaux, P.
Choix d'une méthode d'ouverture en forêt pour une plantation de palmiers à huile. **(Choice of a method of opening-up forest land for the establishment of an oil palm plantation.)**
Oléagineux, 1961, **16**: 149-54, bibl. 11, illus.

The needs of the oil palm, particularly as regards soil nutrients and humus, are considered. It is suggested that, since new and rational methods of estimating fertilizer needs are available, it is now less important to maintain the humus level by avoiding burning and by cover cropping than hitherto. A carbon content of 1·5% in the top 20 cm. of soil in a 5-year-old plantation is, however, regarded as minimal.—I.R.H.O.

5380. Surre, C., Fraisse, A., and Boyé, P.
Plantation de palmiers à huile sur sol de forêt et sur savane à *Imperata.* Méthodes et prix de revient. **(Planting oil palms on forest soil and on lalang grass savannah: methods and cost.)**
Oléagineux, 1961, **16**: 91-9, bibl. 5, illus.

The first part deals with the methods used in demarcating and clearing forest areas and the cost of so doing in labour and money. In the second part the eradication of lalang grass (*Imperata cylindrica*) by cross ploughing followed by 6 discings is described and costed.

5381. Rees, A. R.
Midday closure of stomata in the oil palm *Elaeis guineensis* Jacq.
J. exp. Bot., 1961, **12**: 129-46, bibl. 24.

Under the natural climatic conditions of West Africa, midday closure of stomata in 3–6-year-old palms occurs only in the latter half of the dry season, when soil moisture is low and air temperatures are high. Using an infiltration method, attempts were made to determine the climatic factors which affect stomatal closure. The extent of midday closure is closely related to air and shade temperature under the palm, but the aperture-temperature curves are different for watered and unwatered palms in the dry season, the difference being greater at higher temperatures. Watering reduces closure by changing the aperture-temperature relationship. Under natural conditions this effect is usually obscured because of lower temperatures in the dry season following rain. During *Harmattan* weather, with very low relative humidities, the aperture-temperature relationship broke down. [From author's summary. For earlier work, see *H.A.*, 29: 903.]—W.A.I.F.O.R., Benin, Nigeria.

5382. Gunn, J. S., and Tatham, P. B.
Diquat as an arboricide.
Nature, 1961, **89**: 808-9, bibl. 2.

For the destruction of oil palms prior to replanting diquat proved more reliable than sodium arsenite. The effects of different rates of application are described, the method being to pour the diquat into downward sloping holes, 8 in. deep, punched 2–3 ft. from the ground in the trunks of the palms with a crowbar. Each hole was then almost filled with water. Doses of 40 g. or more caused rapid death, 20-g. doses were slow but sure, and 10-g. doses too small.—W.A.I.F.O.R., Benin, Nigeria.

5383. Coursey, D. G., and Eggins, H. O. W.
Microorganismes responsables de l'altération de l'huile de palme pendant le stockage. (**Micro-organisms responsible for the deterioration of palm oil during storage.**)
Oléagineux, 1961, **16**: 227-33, bibl. 25.

A study of the microflora of palm oil sampled in 43 areas of Nigeria is reported. Numerous fungi were isolated and the lipolytic action of separate cultures of them was studied. The rates of change are shown for 8-week periods for 10 species. *Aspergillus niger* was the most active. Other strongly active species were *A. tamarii*, *Paecilomyces varioti*, and *Sclerotium* sp.—W. Afr. Stored Products Res. Unit, Port Harcourt, and Univ. Coll., Ibadan, Nigeria.

Papaws.

(*See also* 4820, 5260, 5394, 5584.)

5384. Singh, S. N.
Testing viability of papaya pollen in artificial medium.
Hort. Advance, 1959, **3**: 111-14, bibl. 1.

Maximum germination, namely 67·6% of cold-stored pollen, and tube growth were obtained in a 5% sucrose solution plus 1% agar.

5385. Stambaugh, S. U.
Multiple top papaya plants. [Spanish summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 48-50.

Plants of the varieties Blue Solo, Tapachula Red and Pueblo had the terminal bud removed when they were 30–36 in. in height and the buds in the leaf axils scraped off to about 12–20 in. from the ground. The scraping was repeated at 2-day intervals until 3 or 4 suckers appeared near the base of the plant. A high percentage of multiple top plants of similar size, with the fruit nearer to the ground for easier harvesting and bearing 50% more fruit than single top plants, were produced in this way.

5386. Tandon, I. N.
Studies in the control of damping-off of papaya (*Carica papaya* L.)
Hort. Advance, 1959, **3**: 115-22, bibl. 14.

Control of *Pythium aphanidermatum* may be obtained by seed treatment plus soil sterilization. Germination was improved by treating the seeds with Agrosan GN, PCNB or Ceresan. The following soil treatments were effective, in descending order: steam sterilization, formalin and drenching with Flit 406 (0·15 to 0·2%).—Hort. Res. Inst., Saharanpur.

5387. Lordello, L. G. E.
Meloidoginose do mamoeiro. (***Meloidogyne* attack on papaw.**) [English summary ¼ p.]
Rev. Agric., Piracicaba, 1960, **35**: 189-91, bibl. 8.

Symptoms caused by *M. javanica*.

5388. Leiderman, L.
Eficiência de diversos acaricidas e inseticidas sôbre o ácaro tropical do mamoeiro. (**The effectiveness of various acaricides and insecticides against the tropical mite of papaws.**)
Biológico, 1961, **27**: 5–9, bibl. 3.

The most effective treatments for controlling *Hemitarsonemus latus* on papaw trees in São Paulo, Brazil, were dusting with 70% sulphur or 5% Kelthane and spraying with 1% wettable sulphur or 1% Thiovit. Treatments were necessary at least every 2 weeks from January to May. Several other products tested were less efficient and/or phytotoxic.

5389. Ragazzini, R.
Considerazioni sulle possibilità di produzione industriale della papaina in Somalia. (**Observations on the possibility of producing papain on a commercial scale in Somalia.**)
Riv. Agric. subtrop. trop., 1960, **54**: 556-70, bibl. 5.

Composition figures are given for papaw fruit, and its culture and the collection and processing of the latex are described. The uses of papain are enumerated and world production and trade are briefly discussed.

5390. Giorio, C.
Analisi dei costi di produzione della papaina in Somalia. (**Analysis of the cost of producing papain in Somalia.**)
Riv. Agric. subtrop. trop., 1960, **54**: 571-4.

Including initial and annual cultivation, extracting and drying the latex, and overheads.

5391. Singh, M. P.
Studies in pectin production from lanced papaya fruits. Effect of levels of maturity and lancing on pectin content of fruits.
Hort. Advance, 1959, **3**: 102-7, bibl. 6.

The highest pectin contents were found between the 7th and 13th weeks, but the highest yields were obtained in the 17th–18th week. Lancing resulted in slightly higher pectin yields. probably as a result of the healing process, and did not affect the period of ripening.—Hort. Res. Inst., Saharanpur.

Pineapples.

(*See also* 3703, 5560, 5572, 5577, 5584.)

5392. Aghion, D., and Beauchesne, G.
Utilisation de la technique de la culture stérile d'organes pour obtenir des clones d'ananas. (**The use of the sterile tissue culture technique to obtain pineapple clones.**)
Fruits d'Outre Mer, 1960, **15**: 444-6, bibl. 2, illus.

Sterilized stem fragments from young pineapples were cultured on a gelatin medium containing

½-strength Knop's solution, Berthelot's minor-element mixture, glucose and certain B vitamins plus coconut milk. After 6–7 weeks the plantlets were transferred to a fresh culture medium, containing either IAA or maize milk, to induce root formation. Within a few days those on the latter medium produced axillary buds which soon developed chlorophyll. Roots appeared sparsely and slowly. The main difficulties to be tackled in further experiments are improved disinfection without injury to the inner tissues, and improved root formation before transference from the gelatin to a liquid medium.

5393. Py, C.
Influence de la date de plantation et du poids des rejets sur la croissance des plants d'ananas en Guinée. (**The effects of planting date and sucker weight on the growth of pineapple plants in Guinea.**) [English, German, Spanish and Russian summaries approx. ¼ p. each.]
Fruits d'Outre Mer, 1960, **15**: 451-3, illus.

Suckers weighing 400–500 g. produced plants which had more leaves, were more drought-resistant and bore heavier fruit than those weighing 200–300 g. The best time for planting in the absence of irrigation was the second half of the rainy season, and flowering was induced a year later by acetylene treatment. For irrigated plantations it was generally profitable to plant smaller suckers during the early part of the rainy season, but there was a risk of premature, mediocre fruit being produced. The valuable out-of-season fruit was most readily produced by selecting compact suckers from the base of the fruit, or by planting very large suckers in December, irrigating during drought, and treating with acetylene 6–7 months later.

5394. Noffsinger, T. L.
Leaf and air temperature under Hawaii conditions.
Pacific Sci., 1961, **15**: 304-6, bibl. 3.

Air temperature, as measured in an instrument shelter, was not a good measure of plant temperature. Papaw leaf temperatures, characteristic of mesophytes, were fairly near air temperatures, but leaf temperatures of the xerophytic pineapple averaged 1·5°–3·5° C. higher and reached as much as 7·6° C. higher at times. Generally, but not always, leaf temperatures of both plants were below air temperatures at night.—Univ. Hawaii.

5395. Samuels, G., and Gandía-Díaz, H.
A comparison of the yield and nutritional requirements of the Red Spanish and Smooth Cayenne pineapples. [Spanish summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 41-7, bibl. 5.

Different levels of N as ammonium sulphate, P as superphosphate and K as potassium chloride were applied in 3 applications to both varieties, 2 further applications being made to the ratoon crops. Smooth Cayenne yielded more per acre than Red Spanish in both plant crop and ratoon. Nitrogen applied at 200 lb./acre produced a 2-ton increase in yield of both varieties in the ratoon crop and also in the plant crop of Red Spanish. No responses followed P and K applications. Data are given for leaf contents of N, P and K associated with optimal production.—Univ. P.R., Río Piedras.

5396. Bonnet, J. A.
Radioactive tracer research with Puerto Rico soils and horticultural crops. [Spanish summary 1 p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 35-40, bibl. 9.

Trials were carried out on coffee trees in Catalina clay (pH 5·2) and Alonso clay (pH 5·0), and on pineapples in Lares clay (pH 4·2), all 3 soils being deficient in P. Radioactive superphosphate was supplied to the pineapples at the rate of 50 lb. P_2O_5/acre and at 1 lb./tree to the coffee. Foliar analysis 1–3 months later showed that 97–99% of the total pineapple leaf P had been absorbed from the soil, but, where the fertilizer had been applied to the outer segment or to the whole area below the canopy of the coffee trees, only 6–14% absorption of P had taken place owing to competition from neighbouring trees or shade trees and also to root damage caused during the construction of new terraces. More Fe was absorbed by 6- to 11-month-old pineapples when it was applied in solution through the crown than when it was applied to the soil.—Univ. P.R., Río Piedras.

5397. Cannon, R. C.
Recent developments in weed control in pineapples.
Proc. 2nd Aust. Weeds Conf., 1960, Pap. 16, pp. 3.

Experimental work with 9 herbicides is very briefly reviewed. For PCP, used pre-emergence, a volume rate of at least 200 gal./acre has been found necessary. Contact sprays based on PCP (with diesel oil or creosote) gave only temporary control of grasses and are therefore not a satisfactory alternative to pre-emergence sprays. Monuron appeared to give better grass control than PCP and at 8 lb./acre produced no symptoms of injury in pineapples. Diuron promised to be equal or superior to monuron. Atrazine also appeared very promising, being superior to simazine, and at 2 lb./acre caused no injury. Both TCA and dalapon caused injury even at 1 lb./acre. [See also *H.A.*, 31: 1497.]—Qd Dep. Agric., Brisbane.—From *Weed Abstr.*, **10**, No. 267.

5398. Wang, H., Chang, S. M., and Huang, C. C.
Studies on methods of increasing the ratoon crop yield of pineapple. [Chinese, with English summary 1½ pp.]
J. agric. Ass. China, 1960, No. 32, pp. 38-47, bibl. 12.

Plants used in these trials consisted of: (1) ordinary Smooth Cayenne, (2) the Collar of Slips strain treated with calcium carbide 1 year after planting, (3) Collar of Slips with all but 3 slips removed within 20 days of blossoming and (4) untreated Collar of Slips. The fruit setting percentages showed no significant differences in the plant crop, but treatments 1 and 2 resulted in the highest set in the ratoon crop and also in the highest yields and heaviest fruit. Plants of treatment 2 matured 2 months earlier than the rest of the plant crops, but the highest yields were obtained from treatment 1. Total yields of the plant crop plus the ratoon crop were higher with the first 3 treatments than with treatment 4.—Fensham trop hort. Exp. Stat.

5399. Anon.
Comparaison de la résistance au wilt de différentes variétés d'ananas. (**Comparison of the wilt resistance of some pineapple varieties.**) [English, German, Spanish and Russian summaries about 14 lines each.]
Fruits d'Outre Mer, 1960, **15**: 491-2, bibl. 1, illus.

In a variety trial, in which no pest control measures were attempted, the variety Lady Rothschild and clones of Smooth Cayenne from Martinique and the Ivory Coast were found to be susceptible to wilt (caused by *Pseudococcus brevipes*), whereas a Smooth Cayenne clone from Guadeloupe was completely resistant and another from Santo Domingo only slightly susceptible.—Stat. rég. Cult. fruit. Antilles.

5400. Smith, W. A., and Kirkpatrick, T. H.
Benzene hexachloride in pineapple fields.
Qd J. agric. Sci., 1960, **17**: 67-8, bibl. 1.

Soil dressings of 10% BHC dust (1·3% gamma isomer) were applied in 10-in. bands between the rows before planting pineapples, in order to control scarabaeid larvae. Rates of application ranged from 56 to 168 lb. per acre, and a tasting panel could detect no taint in the ripe fruit.

Rubber trees.

5401. Townsend, C. H. T., Jr.
Progress in developing superior hevea clones in Brazil.
Econ. Bot., 1960, **14**: 189-96.

The selection of seedlings and budwood from trees resistant to South American leaf blight (*Dothidella ulei*) is described. In a breeding programme to combine quality and yield with resistance certain clones of *H. benthamiana* proved especially useful as blight-resistant breeding material. *H. pauciflora* has also proved valuable for imparting blight-resistance and vigour. Very few F_1 selections, however, have given good yields, and it seems likely that breeding and selection will have to be continued to the third generation.—U.S. Operations Mission to Brazil.

5402. Hurov, H. R.
Investigations into the green bud strip budding of 2-8 month old rubber seedlings.
Hurov, H. R., and Chong, Y. F.
Illustrated description of the green bud strip budding of 2-8 month old rubber seedlings.
Pamphls Dep. Agric. N. Borneo, **8** and **9**, 1960, pp. 16 and 44, No. 8, bibl. 11, No. 9, illus.

Bud-grafts made on 100,000 seedlings showed 65–95% success in both the nursery and the field. Suitable seedlings for budding varied from ¼–1 in. in basal diameter and budwood came from the non-leafy buds of green, terminal growth flushes. Heights of 2–5-month-old budded seedlings, 20 months after initial sowing, were 6–10 months in advance of conventional 1-year-old budded seedlings. Stumped buddings could be successfully transplanted 10–13 months after initial planting or about 1 year earlier than conventionally budded seedlings. The second pamphlet illustrates the method step by step.

5403. Mendes, L. O. T.
Observaçoẽs sôbre a produtividade de seringueiras (*Hevea brasiliensis* Muell.-Arg.) plantadas de sementes, II-V. (**Observations on the productivity of seedling rubber, II-V.**) [English summaries.]
Bragantia, 1960, **19**: 393-417, bibl. 2, 419-33, bibl. 2, 689-709, bibl. 4, and 711-29, bibl. 3.

Each part deals with the productivity of seedling rubber in a separate plantation and on trees of different ages. In all cases a half-spiral, alternate-daily tapping system was employed. The yield data, which are presented, indicate the various percentages of the populations which provide the, by no means commensurate, percentages of the total yields. These figures lead to the conclusion that relatively high-yielding plantations may be obtained from unselected seed by close planting followed by the elimination of low-yielding trees. [For part I, see *H.A.*, 31: 1507.]

5404. Otoul, E.
Le système radiculaire de l'hévéa dans les conditions écologiques de Yangambi. (**The root system of hevea in the ecological conditions of Yangambi.**)
Publ. Sér. tech. Inst. nat. Étude agron. Congo **62**, 1960, pp. 61, illus.

The development of the root system is described, with the aid of diagrams and photographs, from germination to the adult tree, together with considerations of depth, spread, the root:shoot ratio and of the influence on the root system of such factors as planting material, soil type, cultural practices and cover crops.

5405. BOLTON, J.
The response of hevea to fertilizers on a sandy latosol.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 178-90, bibl. 11.

The response in growth and yield is recorded, over 10 years of immaturity and 12 years of tapping, to N, P and K, singly and in combinations. Phosphates had the greatest effect; there was a smaller response to N, and K was practically ineffective. It appeared that low Mg levels in the trees had some influence on the responses.

5406. MAERTENS, C.
Efficacité et rendement économique d'un traitement contre les pourridiés de l'hévéa **(The effectiveness and economic value of a treatment for rots in hevea.)**
Bull. agric. Congo, 1960, **51**: 845-84, bibl. 4, illus.

The early diagnosis of infection by *Fomes lignosus* and *Armillariella* [*Armillaria*] *mellea* is described, and details are given of the method used to remove infected roots. Comparisons are made between the mortality, growth, yield and economic returns of treated and control plots.

5407. JOHN, K. P.
Loss of viability of three root parasites in infected root sections buried in soil.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 173-7, bibl. 4.

Hevea roots infected with *Fomes lignosus*, *F. noxius* and *Ganoderma pseudoferreum* were buried in timber-free soil and examined periodically. The loss of viability in all 3 fungi was found to be inversely related to the size of the piece of root, *G. pseudoferreum* being the most persistent. In general, the fungi persisted for up to 4 years in roots 3 in. in diameter. In a second experiment the inoculated roots were buried in an area already planted with rubber, and, in this case, the disintegration was much more rapid, *F. lignosus* being no longer viable in the largest pieces of root after 12–15 months. Loss of viability also appeared to be independent of root size.

5408. GAYOSO, R. M. P.
Cancro estriado do painel da seringueira. **(Striped canker [black thread] of hevea tapping panels.)**
Biológico, 1960, **26**: 248.

Most of the hevea clones which are resistant to South American leaf blight (*Dothidella ulei*) are susceptible to black thread (*Phytophthora palmivora*). Certain hybrids of *H. brasiliensis* × *H. benthamiana* have proved tolerant to black thread. As copper fungicides used against the disease tend to make rubber processing difficult, tests with other fungicides are in progress.

5409. SOUTHORN, W. A.
Thread-like reticulum in latex from *Hevea brasiliensis* and its relation to latex particles.
Nature, 1961, **189**: 1000-1, bibl. 9, illus.
Microscope studies on fresh hevea latex.
Rubb. Develop., 1961, **14**(1): 2-6, bibl. 12, illus.

Studies using phase microscopy after high-speed centrifuging are reported. The reticulum which links the different types of particle in the various zones [see *H.A.*, 31: 1518] is now shown to be tubular and sometimes to enclose small particles. It is considered a likely site for particle synthesis. —R.R.I.M., Kuala Lumpur, Malaya.

5410. MOIR, G. F. J., AND TATA, S. J.
The proteins of *Hevea brasiliensis* latex. Part 3. The soluble proteins of "bottom fraction".
J. Rubb. Res. Inst. Malaya, 1960, **16**: 155-65, bibl. 20, illus.

Identification of 8 proteins by paper electrophoresis. [For part 2, see *H.A.*, 26: 2245; for part 4, *H.A.*, 31: 1517.]

5411. BOATMAN, S. G.
Detection and estimation of growth substances in hevea latex.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 166-72, bibl. 6.

The effects of different extracts of latex, isolated by paper chromatography, on *Avena* coleoptile growth were compared with those of IAA. A zone of slight activity was found at Rf 0·2, and a double zone of pronounced activity at Rf 0·6–0·9. Colour tests indicated, however, that IAA was not present in the latex extracts.

5412. FADERL, N., AND MAUN-ALIBAZAH, P.
Penentuan magnesium dalam lateks dengan kuning-titan. (**Determination of magnesium in latex by the titan yellow method.**) [English summary 12 lines.]
Menara Perk., 1961, **30**: 3-10, bibl. 25, and *Bull. Res. Inst. S.P.A.*, 1960, No. 29, pp. 15, bibl. 25.

After ashing the dried latex film the residue is dissolved, and, when the Fe and phosphate have been separated, Mg is determined colorimetrically at a wavelength of 547 mμ.

Sugar cane—general.

(*See also* 5576.)

5413. I.S.S.C.T.
Proceedings of the 10th Congress of the International Society of Sugar Cane Technologists, Hawaii, 1959, Elsevier Publishing Co., Amsterdam, etc., 1960, 10×6½ in., pp. 1174, bibls numerous, illus., distributed by D. Van Nostrand Co., New York, Toronto, London, $20.00.

The papers delivered at the Congress are published under the following headings: General sessions, factory, agriculture, breeding, entomology and pathology. Of 250 papers in all, over 50 have been abstracted separately and may be found in this number of *H.A.* These are mainly from the agriculture section, with selected papers only from the breeding, entomology and pathology sections. Numerous other articles have been abstracted from other sources in recent numbers of *H.A.*

5414. QUEENSLAND.
60th Annual Report of the Bureau of Sugar Experiment Stations, Brisbane, 1960, pp. 102, illus.

Soils and agronomy: In 47 observational trials of green manuring plus a top dressing of ammonium sulphate only 11 showed any increase due to the top dressing and in only 4 of these could the increase have exceeded 5 tons per acre. The top dressing, moreover, appeared to depress the C.C.S. In all 9 potash trials yields were raised by the application of KCl. A dressing of 14 lb. $CuSO_4$ per acre was found adequate to prevent droopy top. The effect of high salinity on growth in glasshouse cultures became greater as the plants aged. The most satisfactory control for *Cucumis metuliferus* proved to be 2,4,5-T butyl ester. *Sorghum halepense* was controlled by dalapon and *Passiflora foetida*, in the early stages, by CMU. Nemagon was found to be the most effective nematicide. *Plant breeding:* New varieties approved for planting were Q.69, 71, 72, 73 and Damon. *Entomology and pathology:* Both lindane and crude BHC dust were effective against cane grubs; aldrin proved best against funnel ants (*Aphaenogaster pythia*) and γ-BHC gave good control of soldier fly (*Metoponia rubriceps*). Work continued on the selection of disease-resistant strains.

5415. HAWAIIAN SUGAR PLANTERS' ASSOCIATION.
Report of the Hawaiian Sugar Planters' Association Experiment Station, October 1, 1959, to September 30, 1960, 1960, pp. 85, illus.

Cultural practices: Marked responses to $CaSO_4$ were obtained in potted plants grown in low-S soils. In field experiments liming increased the rate of mineralization of organic N, reduced the amount of soluble Al and reduced the leaching of K from the soil. Soil heating in a field at 1,350 ft. altitude caused greatly increased tillering. Considerable varietal differences in response to N fertilization were observed. Studies with labelled Ca and N demonstrated the movement of Ca in the plant and the ready uptake of aqua ammonia from the soil. By using labelled C in CO_2 the order of appearance in photosynthesis was shown to be: malic and aspartic acids, phosphoglyceric acid, glyceric acid, fructose di-phosphate, glucose-1-phosphate, sucrose, fructose. Between 56° and 74° F. the rate of node formation was directly related to air temperature. In an NPK experiment P deficiency had the greatest effect in reducing photosynthetic activity and K deficiency the least. *Diseases:* Of 90 chemicals tested 23 effectively inhibited *Pythium graminicolum* but only 7 affected *Ceratocystis paradoxa*, dexon and captan being outstanding. Methyl bromide and certain other fumigants proved highly effective against both nematodes and soil fungi. *Insect and rat control:* A new rat bait made from raw sugar and rolled oats for use with Warfarin, and a new "inverted-T" dispenser were found effective. *Irrigation:* In-line watering required 25·6% more water than between-line irrigation and "U" shaped furrows used more water than "V" shaped. *Mechanization:* Amongst the equipment tested were harvesters, a disc-type stubble shaver, a cutter rake, cut-convey-load and cut-throw-load harvesters, a cane core sampler and tractors. *Tillage:* An aerial photograph illustrates the reduction in the growth of ratoon cane through soil compaction caused by in-field transport. *Varieties:* Tassel control by CMU was not affected by heavy rain. *Weed control:* The performance of various chemical herbicides is tabulated. Strains of *Cynodon dactylon* have been evaluated for tolerance to dalapon and TCA.

5416. FUNAIOLI, A.
I lineamenti della odierna tecnica di coltivazione della canna da zucchero in Somalia. **(Features of present-day methods in sugar cane cultivation in Somalia.)**
Riv. Agric. subtrop. trop., 1961, **55**: 35-51.

Some of the difficulties to be overcome in growing sugar cane in Somalia are drought, soil salinity and lack of experience. The behaviour of numerous varieties has been tested, the most promising being N:Co.310. Other suitable varieties are listed. Soil preparation, planting, irrigation, cultivation for plant and ratoon crops, fertilization and green manuring are described. Neither bagasse nor molasses give satisfactory results as fertilizers under local conditions. The only essential element markedly deficient is N, and this is supplied as top-dressings of urea. Drainage ditches are essential because the rainfall, though restricted in distribution, is very heavy. Mechanical harvesting is not very practicable for plant cane, but is more successful with ratoon crops. The marked falling-off in yields from 1st and 2nd ratoon crops is attributed to the physical deterioration of the soil. The local pests and diseases are enumerated. Hot water treatment has been instituted against ratoon stunting disease, but the results cannot yet be judged.

5417. South African Sugar Journal.
The South African sugar year book, 1959-60.
S. Afr. Sugar Journal, 321 Smith Street, Durban, 1960, 10½ × 8½ in., pp. 272, illus., 10s. (post free).

This is the 30th edition of this comprehensive reference book. It contains much useful information on sugar production in South Africa and elsewhere in Africa, particularly as regards commerce. There are also special articles on various aspects of production and several industrial reviews. It is well illustrated and the statistical section is particularly useful.

5418. Anon.
Mechanization in the Australian cane sugar farming industry and sugar farming machinery for export.
Sugar News, 1960, **36**: 662-3, 678-81.

A survey of planters, harvesters, loading machinery and bulk handling equipment, with the names and addresses of manufacturers.

5419. U.S. Dep. Agric., Foreign Agricultural Service.
World sugar production resumes upward trend.
Foreign Agric. Circ. U.S. Dep. Agric. **FS 5-60,** 1960, pp. 6.

1960-61 total centrifugal sugar estimated at 57·7 m. short tons, of which 32·2 m. is cane sugar.

Sugar cane—breeding, flowering and varieties.

(*See also* 5495, 5497, 5498.)

5420. González-Ríos, P.
Development of sugarcane breeding in Puerto Rico.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 732-42, bibl. 8, illus.

Methods and selection criteria.

5421. Veiga, F. M.
Intergeneric cross with sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 765-8, bibl. 1, illus.

In Brazil between *Gynerium* sp. and Co. 421; 3 seedlings were obtained.

5422. Röhrig, P. E., Ellis, T. O., and Arceneaux, G.
Microclimatic modification by mist sprays with polyethylene enclosures in relation to flowering of sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 794-800, bibl. 5, illus.

Soil moisture was increased by shortening the watering cycle from 3 weeks to 1 week; R.H. was increased by 12% and maximum air temperature reduced by 9° F. by a mist spray under polythene sheeting. With P.O.J. 2878 the percentage of stalks flowering was raised from 4·9 to 31·0. B. 42231 also showed an increase, but 4 other varieties failed to flower.—South Puerto Rico Sugar Co., La Romana, Dominican Rep.

5423. Panje, R. R., and Srinivasan, K.
Studies in _Saccharum spontaneum_. A note on the flowering sequence of _Saccharum spontaneum_ clones.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 819-23, bibl. 1.

The date of flowering of some 200 clones at Coimbatore was fairly constant from year to year, the mean deviation being less than ±10 days in 124 clones, and more than ±20 in only 11 clones. In a sample of 72 clones the time of formation of floral primordia and the time of flowering were found to be correlated.—Sugarcane Breed. Inst., Coimbatore.

5424. Ilaga, M. T., Calma, V. C., and Landicho, B. M.
Some effects of topping sugar cane seedlings preceding transplanting.
Sugar News, 1960, **36**: 639-43, bibl. 4.

In a trial comparing seedlings topped a week before transplanting, topped at transplanting time and left untopped more tillers were produced by untopped plants in spite of an initial temporary stimulating effect due to topping. Early topping was worse than topping at transplanting time. Stalk diameters were not affected.—Cent. Exp. Stat., College, Laguna, Philippines.

5425. Herbert, L. P., and Newton, B. S.
Bunch planting of sugarcane seedlings at the U.S. Sugarcane Field Station, Houma, Louisiana.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 715-20, bibl. 5.

Preliminary results indicated that bunch planting assured a better stand after the first winter, and, in 2 crosses, the percentage of acceptable plants rose from 3·85 for single plants to 4·73, 4·65 and 4·15 for multiple units of 2, 3 and 5 plants, respectively.—U.S.D.A., and Amer. Sugar Cane League, La.

5426. URATA, R., AND WARNER, J. N.
Criteria for sugar-cane selection in Hawaii.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 702-8, bibl. 2.

Germination and ratooning; tillering; size, growth, anchorage and toughness of stalk; quality of tops and closing-in; hardness and fibre content of cane; juice content; ratooning; disease and drought resistance.—H.S.P.A.

5427. HERBERT, L. P.
Method of determining brix with the hand refractometer in selecting sugarcane seedlings.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 768-74, bibl. 6.

The results obtained from samples taken by a Hawaiian punch from the mid-point of the stalk, from the 3rd and last internodes averaged, or from all the internodes averaged, differed significantly from those obtained from the crusher juice, but could be used with confidence for the initial selection of seedlings. Of the 3 methods of sampling the mid-point is easiest and quickest.—U.S.D.A.

5428. SKINNER, J. C.
Selecting for resistance to lodging in sugar cane.
Proc. 27th Conf. Qd Soc. Sugar Cane Tech., 1960, 1960, pp. 37-45, bibl. 7.

Significant varietal differences were found in the force required to bend the top third of sugar cane stalks from the vertical by 16° or 20° and these forces were positively correlated with resistance to lodging in the field; the name "physical lodging resistance" was given to this figure. No relationship could be found between this characteristic and other desirable qualities, and it is suggested that it depends mainly on the type and size of the root system.—Bur. Sugar Exp. Stats, Gordonvale.

5429. NEGI, O. P., AND KHANNA, K. L.
Comparative stem anatomy of erect and lodging forms of *Saccharum spontaneum* L.
Indian J. Sugarcane Res., 1961, **5**: 75-82, bibl. 7, illus.

Erect forms are characterized by fewer vascular bundles and, in the lower part of the stem, greater development of sclerenchymatous tissue in the peripheral regions with larger vascular bundles in the centre.—Sugarcane Res. Inst., Pusa.

5430. GEORGE, E. F.
Effect of the environment on components of yield in seedlings from five *Saccharum* crosses.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 755-65, bibl. 3.

Seedlings from 5 crosses were planted in 4 areas of contrasting climate. Studies of various plant characters showed that differences due to genotype were consistent and that the overall response to a particular environment was the same for all.—Mauritius Sugar Ind. Res. Inst.

5431. SKINNER, J. C.
Smaller plots for variety trials.
Cane Grs' quart. Bull., 1961, **24**: 133-4, illus.

Experiments have shown that plots 3 rows wide and about 1/100th acre in area can be used efficiently for replicated trials in place of the 1/20th acre plots used previously.

5432. MUNGOMERY, R. W.
An appraisal of the approved varieties for the Mackay-Prosperpine area.
Proc. 25th Conf. Qd Soc. Sugar Cane Tech., 1958, 1958, pp. 135-40.

Q.50 was by far the most important variety, but its susceptibility to red rot late in the season has led to its partial replacement by resistant varieties such as Q.65. Q.58 was growing in popularity, and the comparatively recent Q.63 appeared very promising.—Bur. Sugar Exp. Stats, Brisbane.

5433. WESDORP, J.
Q.67 in the Burdekin district.
Cane Grs' quart. Bull., 1961, **24**: 140-2, illus.

Q.67 is a lodging-resistant and relatively early maturing alternative to wind-susceptible Pindar, but it is susceptible to ratoon stunting disease and liable to top rot.

5434. BIRKETT, L. S., AND CAMERON, C.
Field experiments with sugar cane, XXVIII. 1. Variety trials, 1959.
Sugar Bull. Brit. Guiana Dep. Agric., 1959, No. 28, pp. 2-58.

The two major commercial varieties, B.41227 and B.37161, have continued to do well and are still recommended. In a dry year the former variety ripened early and showed a tendency to split stems accompanied by rapid drying out and some rotting. The other canes recommended for less widespread planting are B.47258, B.4362, which yielded well in a dry season, D.141/46, which was outstanding as an autumn cane on silty clay, and Co. 419. The performances of many other varieties in trials is fully reported.

5435. ANON.
S.A. sugarcane varieties to be given names.
S. Afr. Sugar J., 1960, **44**: 1033.

The first 5 are: N.50/211 = Salvo, N.10 = Saccharine, N.51/168 = Saraband, N.51/539 = Sabre and N.52/219 = Salute.

5436. ANON.
New sugarcane for Georgia.
Agric. Res., Wash., 1960, **9**(5): 15.

C.P.52-48 gives higher yields of syrup per acre than the varieties used at present and is superior to them in early germination, growth and lodging resistance. The % juice extracted, brix, clarification and syrup quality are equal to those of C.P.29-116, and it is suitable for mechanized harvesting. Mosaic disease has not been observed and damage from red rot has been unimportant.

Sugar cane—planting, growth, climate and irrigation.
(*See also* 5424, 5425, 5446.)

5437. (HEBERT, L. P., AND MATHERNE, R. J.)
Deeper planting boosts sugarcane yield.
Agric. Res., Wash., 1960, **9**(4): 12, illus.

With August planting the placement of the setts only 2 in. above the bottoms of the furrows, instead of the usual 6–7 in. above the furrow bottoms, resulted in a yield increase of nearly 6 tons/acre. —U.S. Sugarcane Field Stat., Houma, La.

5438. PANJE, R. R., AND PRASAD, P. R. J.
The effects of ionizing radiations on sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 775-81, bibl. 7, illus.

Dosages ranging from 5–14,400 r of γ-radiation from a Co^{60} source to single-budded setts induced faster growth in all cases except 5, 6,000, 6,200 and 14,400 r, the last showing the poorest growth and 50% mortality. Buds of Co.419, however, were killed by pile neutron doses of 2,560 rads, whereas 6 to 8 hours' exposure to thermal neutrons, $3 \cdot 7 \times 10^7$n/cm.^{2}/sec., caused no visible damage to Co.419 and Kaludai Boothan. [See also *H.A.*, 30: 1368.]—Sugarcane Breed. Inst., Coimbatore.

5439. COLEMAN, R. E., AND OTHERS.
The effects of gibberellic acid on sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 588-602, bibl. 10.

None of the physiological responses of sugar cane to treatment with different concentrations of GA is considered to afford practical means of increasing sugar production. The germination of setts was reduced by concentrations as low as 10 p.p.m. Applications to growing plants increased their height but reduced stalk diameter and tillering and failed to increase yields. Treatment during and after the development of the flower primordia had no effect on the percentage of flowering or the growth of the inflorescence.—U.S.D.A.

5440. CAMPBELL, R. B., CHANG, J.-H., AND COX, D. C.
Evapotranspiration of sugar cane in Hawaii as measured by in-field lysimeters in relation to climate.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 637-45, bibl. 15.

A comparison between measurements from lysimeters, 4 sq. m. in area, and the standard Weather Bureau pans at 3 sites showed that the lysimeter/pan ratio increased with the growth of the cane and closure of the canopy. It rose from an initial 0·4 to an average of about 1·2 when the cane was 6–8 months old, then declined to about 1·0 at 10–14 months and finally rose again to 1·3.—H.S.P.A., Honolulu.

5441. LYONS, E. S.
Precipitation-temperature effect on cane yields.
Sugar y Azúcar, 1959, **54**(9): 29, 38.

Statistical examination of yield, mean monthly temperature and monthly rainfall records over 20 years, for the variety C.P. 29-116, gave yield/rainfall correlations for April and September and yield/temperature correlations for March and August. Yields were above normal when both March temperatures and April rainfall were above average, and usually so when either of these factors obtained.—U.S.D.A., Cairo, Ga.

5442. CHOUDHURY, J. K.
Effect of irrigation and ammonium sulphate on the growth, yield and quality of sugarcane (Co.453).
Indian Agriculturist, 1960, **4**: 33-43, bibl. 11, from *Trop. Abstr.*, 1961, **16**, Abstr. i416.

Two irrigations were applied in pre-monsoon months and fertilizer was applied either once or in doses. Irrigation significantly increased the height, yield and the number of mature canes. The application of fertilizer with irrigation was of additional advantage. Treatment effects were insignificant with respect to germination rate, average number of tillers per clump, number of mature green leaves on the mother-shoot and percentage of sucrose.

Sugar cane—soil management and weed control.
(*See also* 3734, 5462, 5475, 5476.)

5443. TROUSE, A. C., JR., AND HUMBERT, R. P.
Some effects of soil compaction on the development of sugar cane roots.
Soil Sci., 1961, **91**: 208-17, bibl. 4, illus.

Critical soil bulk densities for rooting of sugar cane have been empirically established for the principal cane soils in Hawaii. Studies with radioactive Rb in soils compacted to different densities indicated a decrease in rooting efficiency with increasing soil density. [From authors' summary.]—H.P.S.A., Honolulu.

5444. BIRKETT, L. S., AND CAMERON, C.
Field experiments with sugar cane, XXVIII. 2. Cultivation experiments.
Sugar Bull. Brit. Guiana Dep. Agric., 1959, No. 28, pp. 59-60.

The yield and quality of a second ratoon crop were higher with the Cameron-Williams method of deep cultivation as compared with normal practice. Similar results were obtained in the plant and first ratoon crops [see *H.A.*, 30: 1352].

5445. ADLAKHA, P. A., AND GILL, H. S.
Effect of some cultural operations on sugarcane.
Indian J. Sugarcane Res., 1961, **5**: 87-91, bibl. 2.

In the event of rain during the germination period blind hoeing [i.e. hoeing before the cane is visible] was found to be essential on sandy and sandy loam soils, but otherwise the absence of hoeing did not affect the rate or final percentage of germination. Row cultivation by bullock drawn implements, when compared with hand hoeing in the early stages of growth, resulted in reductions of stalk elongation, millable cane length and cane yield.—Sugarcane Res. Stat., Jullundur.

5446. KHAN, A. R., AND MATHUR, B. P.
Studies on tillage. X. Effect of cultivation treatments, levels of nitrogen and irrigation interval on the yield of sugarcane.
Indian J. Sugarcane Res., 1961, **5**: 83-6, bibl. 17.

Three cultivation depths (4–5 in., 6 in. and 10 in.), 3 levels of ammonium sulphate (80, 120 and 160 lb. N/acre after a basal dose of 10 tons F.Y.M.) and 3 irrigation intervals (10-, 15- and 20-day) were tested, but no significant differences due to treatments were found.—Indian agric. Res. Inst., New Delhi.

5447. HERBERT, L. P., AND DAVIDSON, L. G.
Effect of cane trash, legumes, and bagasse on cane and sugar yields and on the organic matter content in Louisiana sugar-cane soils.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 565-79, bibl. 14.

In trials over 26 years on a moderately well-drained, light silt loam, both cane and sugar yields were highest where cane trash and soya beans were ploughed in and lowest where they were completely removed. The soya beans were somewhat less effective than 40 lb. of N as ammonium sulphate and did not appreciably affect the organic matter content of the soil. In a 17-year trial on a somewhat poorly drained silt loam, however, better yields were obtained by burning the cane trash, turning in the soya beans and adding N to the plant cane. Both the sowing of *Melilotus indica* as a winter legume and the addition of bagasse to the soya beans before ploughing in depressed yields. The turning in of soya beans alone increased the organic status of the soil. None of these treatments had any effect on yields in a further experiment on a poorly drained silty clay soil, but burning the cane trash increased the soil organic matter content more than ploughing in.—U.S.D.A.

5448. PEARSON, C. H. O.
The conception of farming on sub-tropical soils, with the use of the crop by-product, trash, as a means to improve yields.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 579-86, bibl. 2.

Experiments are cited to show that conserving the trash on the soil surface between the rows increases cane yields in the 2nd ratoon crop, except where the drainage is poor or the organic status is high. No residual effect into the 2nd plant cane cycle resulted from green manuring and a 12 months' fallow. It is suggested that the rotting trash from the plant cane acts as a mulch in the 1st ratoon crop and as an organic layer in the 2nd.—S. Afr. Sugar Ass. Exp. Stat., Mt. Edgecombe.

5449. STORY, C. G.
Some soil management practices in the Mackay District.
Proc. 25th Conf. Qd Soc. Sugar Cane Tech., 1958, 1958, pp. 169-73, bibl. 1.

The results of using bagasse to improve the physical condition of heavy, black, clay loam soils are discussed, and this method is considered superior to green manuring every 3–4 years.

5450. HANSON, N. S.
Chemical weed control in Hawaii.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 538-47, bibl. 8, illus.

This historical review notes the present extensive use of sodium dalapon, trials of simazine, Silvex, amitrol and other herbicides, and the appearance of dalapon-resistant strains of *Cynodon dactylon* and also forms of *Commelina diffusa* resistant to 2,4-D. [See also *H.A.*, 31: 1532.]—H.S.P.A., Honolulu.

5451. ROCHECOUSTE, E.
Evaluating herbicides in sugar-cane cultivation.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 549-55, bibl. 5.

The method of evaluation used in Mauritius is described. In this an "overall effect" is found by averaging the "mortality-abundance rating" for the commoner weed species found in the area. Cane injury is also assessed.—Mauritius Sugar Ind. Res. Inst.

5452. NAIL, J. R., AND OTHERS.
Pre-emergence herbicides reduce labour costs.
Sugar y Azúcar, 1959, **54**(9): 30-1, 40, illus.

The commercial use is described of Telvar (monuron), Karmex (diuron) and 2,4-D in Hawaii, Puerto Rico, Dominica, Mauritius and South Africa. Telvar appears to be the most effective in high rainfall areas.

5453. STAMPER, E. R., AND CHILTON, S. J. P.
The effect of Silvex (2,4,5-TP) used as a chemical herbicide on sugarcane in Louisiana.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, p. 537.

Pre- and post-emergence band applications of Silvex at 1 lb./acre resulted in small but consistent yield increases compared with dalapon or 2,4-D + TCA, though control of Johnson grass seedlings was poorer. Increases of the order of 400 lb. of 96° sugar per acre were obtained with both Silvex and dalapon. [See also *H.A.*, 28: 1354.]—La agric. Exp. Stat., Baton Rouge.

5454. Stamper, E. R., and Chilton, S. J. P.
The effect of chemicals as herbicides alone and in combination for weed and grass control in Louisiana sugar-cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, p. 556.

Combinations of TCA, dalapon and 2,4-D gave somewhat better control of Johnson grass seedlings in plant cane than TCA alone. In areas of stubble [ratoon] cane heavily infested with Johnson grass an early application of 11 lb./acre of TCA followed by 4–5 lb./acre of dalapon on the drill ($\frac{1}{3}$ of the total area) was the most successful treatment. For other areas 7 lb. TCA + 2–4 lb. dalapon is recommended to control late infestation. [See also *H.A.*, 30: 5309.]—La agric. Exp. Stat., Baton Rouge.

5455. Chapman, L. S.
Dalapon plus 2,4-D for the control of weeds in irrigation channels.
Cane Grs' quart. Bull., 1961, **24**: 115-17, illus.

Good results using 5 lb. dalapon plus 2 lb. 2,4-D in 44 gal. for an 8 ft.-strip 40 chains in length.

5456. Toohey, C. L.
Is chemical control of the common reed possible?
Proc. 26th Conf. Qd Soc. Sugar Cane Tech., 1959, 1959, pp. 81-4, bibl. 3, illus.

Phragmites communis in sugar cane fields was successfully controlled by dalapon. The cane was somewhat damaged but recovered. A dressing of 15 lb. per acre, followed if necessary, by a spot application at $7\frac{1}{2}$ lb., is recommanded.

5457. Fox, E. H.
Dichloropropionic acid as a weedicide in the Tully area.
Proc. 27th Conf. Qd Soc. Sugar Cane Tech., 1960, 1960, pp. 51-3, bibl. 1.

Successful trials with dalapon around tramlines and drainage channels.

5458. Barnard, J. E.
An effective inter-row spray unit.
Proc. 27th Conf. Qd Soc. Sugar Cane Tech., 1960, 1960, pp. 55-7, illus.

To obtain an overall width of only 30 in., a 3-wheel construction with the drive on the single rear wheel was adopted. With a 7-h.p. car engine the unit sprayed an average of 1 acre per hour with a fuel consumption of $\frac{1}{2}$ gal. petrol.

Sugar cane—nutrition.

(*See also* 5442, 5446, 5560.)

5459. du Toit, J. L.
Recent advances in nutrition of sugarcane in South Africa.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 432-40.

The responses obtained in numerous N, P and K trials are summarized and the value of leaf and soil analyses is discussed.

5460. Clements, H. F.
Recent developments in crop logging of sugar cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 522-8, bibl. 8.

Notes on N, K, P, Ca, Mg, minor and toxic elements.

5461. Samuels, G.
The relative merits of various methods of foliar diagnosis for sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 529-35, bibl. 10.

Crop-logging and stalk-logging are evaluated, and the merits of the Jamaican, Mauritian and Puerto Rican methods compared.

5462. Wutke, A. C. P., and others.
Restauração de solo para a cultura da cana-de-açúcar. II. Periodo 1956-58. **(Restoration of soil fertility by sugar cane growing. II. Period 1956-58.)** [English summary 16 lines.]
Bragantia, 1960, **19**: 675-87, bibl. 7.

The treatments in a trial with C.B. 40/69 plant cane on an impoverished sandy clay soil were PCa plus green manure, PK plus green manure, PKCa plus green manure, NPK, NPK plus green manure, NPKCa and NPKCa plus green manure. The rates of application of N, P_2O_5 and K_2O were 90, 120 and 90 kg. per ha., respectively. With the 3 best treatments, namely, PKCa plus green manure (100 tons cane per ha.), NPKCa plus green manure (99·9) and NPKCa (94·3), yields were higher than with the previous crop of Co.419, but with all other treatments they were lower.

5463. Alvarez, R., de Arruda, H. V., and Gargantini, H.
Adubação da cana-de-açúcar. V. Ensaio preliminar de adubação N-P-K em terra-roxa. **(Sugar cane fertilization. V. Preliminary trial of NPK fertilization on terra-roxa soil.)** [English summary 11 lines.]
Bragantia, 1960, **19**: 361-8, bibl. 11.

In a trial with Co.413 at Ribeirão Prêto Experimental Station N was applied at 0, 50 and 100 kg. P_2O_5 at 0, 80 and 160 kg. and K_2O at 0, 60 and 120 kg. per ha. K gave the greatest yield increase, and the relationship between rate and yield was linear. With N the relationship was also linear, but the yield increases were less marked. P did not have a significant effect. The highest yield, 155·4 tons cane per ha., was obtained with the high rate of each element. [For parts III and IV, see *H.A.*, 30: 1361.]

5464. Halais, P.
The determination of nitrogenous fertilizer requirement of sugarcane crops by foliar diagnosis.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 515-21.

The results of foliar analyses from trials at 6 places, each with 6 varieties given 3 levels of N, are evaluated as a means of diagnosing N requirements. [See also *H.A.*, 29: 3068t.]—Mauritius Sugar Ind. Res. Inst.

5465. Tanimoto, T., and Burr, G.
The growth of sugarcane as influenced by nitrogen fertilization.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 450-61, bibl. 1.

Early application of N favoured primary and secondary stalk growth, late application the growth of sucker stalks; but yields of both cane and sugar were more dependent on the amount of N supplied than the timing. Shortage of N had the greatest effect on the basal sections of the primaries. The increased stalk population due to high N fertilization did not raise the percentage of dead stalks at harvest as there was more prolonged top growth. An enhanced N status did not influence the moisture or fibre contents of the millable cane, but raised the purity of the juice to a limited extent.—H.S.P.A., Honolulu.

5466. Takahashi, D. T.
Six years' studies on nitrogen utilization by sugar cane plant using ^{15}N as a tracer.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 377-89, bibl. 24, illus.

Labelled N, when fed to the roots of varieties 37-1933 and 32-8560, was absorbed at different rates. Asparagine appeared to be the first amide formed; protein synthesis occurred in the leaves, roots and meristem, and any excess of N was stored in the basal joints as ammonia, amides, amino acids and peptides. Spraying the 8 leaves of a 10-month-old plant with 2 g. of labelled urea gave a 3·13% increase in the N content 51 days later, 30% of which was retained by the original 8 leaves. In 3 plants 0·2 g. of labelled urea was applied behind the dewlaps of the sheaths, and absorption after 1, 3 and 7 days was found to be 45, 73·8 and 79%, respectively, the movement being first into the adjacent leaf laminae and then into the leaves above the point of application.—H.S.P.A., Honolulu.

5467. Wang, S.-C., and Li, K.-Y.
The development of liquid nitrogenous fertilizers in Taiwan sugarcane agriculture.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 424-32, bibl. 8, illus.

Anhydrous ammonia, aqua ammonia and nitrogen solution No. 4 ($NH_4OH + NH_4NO_3$) have proved as effective as solid forms of N, provided the liquid is covered immediately after its application to a depth of 15–20 cm. depending on the porosity of the soil.—Taiwan Sugar Exp. Stat.

5468. Pramanik, B. N., Lal, J. B., and Saran, M. D.
Effect of organic manures and inorganic fertilizers on the nitrogen and carbon contents of soil under cropped and fallow conditions and their influence on the yield and juice quality of sugarcane.
Indian J. Sugarcane Res., 1961, **5**: 65-74, bibl. 16.

The effects of ammonium sulphate, castor cake, groundnut cake, press-mud, urine-earth, town compost and farmyard manure, all at 120 lb./N per acre, were studied in heavy and light soils. The C/N ratio in the soil at harvest was higher with the bulky manures and lower with other treatments than the initial figures. All treatments except farmyard manure significantly increased sugar yields per acre, the best being ammonium sulphate followed by the cakes. Details of the uptake of N, P, K and Ca from the variously fertilized plots are given.—Sugarcane Res. Stat., Shahjahanpur.

5469. Narasimham, R. L., and Rao, N. V. M.
Influence of organic manures and inorganic fertilizers on soil fertility and sugarcane production.
Indian J. Sugarcane Res., 1961, **5**: 111-12, bibl. 5.

In an experiment comparing ammonium sulphate, groundnut cake, a mixture of the two, and farmyard manure, growth and cane yield were increased most by the inorganic N, whereas juice and *gur* quality was highest with the organic manures. A mixture of inorganic and organic N is recommended for increasing cane yields while still retaining *gur* quality.—Sugarcane Res. Stat., Anakapalle.

5470. Rao, E. J., Rao, R. J., and Rao, S. R.
Studies on the response of sugarcane to phosphatic fertilizers.
Indian Sugar, 1960, **10**: 581-7.

The effects were determined of fertilizing Co.449 with P_2O_5 (100 lb./acre) combined with 4 N levels (0–180 lb./acre) on cane population, yield of millable cane, commercial cane sugar and juice sucrose and purity. P applications had no effect, but N applications increased the number of millable stalks and cane yield, though at the expense of juice quality.—Sugarcane Liaison Fm, Bobbili.

5471. Lal, K. N., and Singh, J. N.
Uptake of phosphorus and its accumulation in component parts of sugarcane as affected by age, phosphorus deficiency and levels of phosphorus.
Soil and Plant Food, 1961, **6**: 120-6, bibl. 9.

The content of P was greatest at 90 days in plants grown in sand cultures deficient in P, whereas in complete nutrient cultures the P content was greatest at 135 days. In P-deficient plants no further uptake of P took place after 180 days. [See also *H.A.*, 30: 4531.]—Banaras Hindu Univ.

5472. Ayres, A. S.
The growth of sugar cane as influenced by phosphorus: the critical range of soil phosphorus.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 462-7, bibl. 2.

Under Hawaiian conditions the critical range proved to be about 30 to 60 lb. P per acre, lower values representing deficiency and higher values sufficiency.—H.S.P.A., Honolulu.

5473. Parish, D. H., and Feillafé, S. M.
Phosphate studies on some latosols of Mauritius.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 417-23, bibl. 8.

Results obtained from experiments started in 1954 showed that soluble phosphates were superior to the local guano-phosphates, although the latter and other forms of insoluble phosphate were absorbed freely on the low humic latosols. Plant crops proved more sensitive to P deficiency than ratoon crops.—Mauritius Sugar Ind. Res. Inst.

5474. Innes, R. F.
The potash manuring of sugar cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 441-9, bibl. 24.

The methods used, including tissue analysis, to determine the potash requirements of sugar cane are reviewed.

5475. Birkett, L. S.
Field experiments with sugar cane, XXVIII. 3. Liming experiments, 1959.
Sugar Bull. Brit. Guiana Dep Agric., 1959, No. 28, pp. 61-4.

This article summarizes the results of liming trials conducted on 3 soil types from 1955–59. Lime was initially applied as 0, 3, 6 and 9 tons per acre. In general, liming increased yields (although not significantly and on one soil only with the 3-ton level), increased the uptake of phosphate and raised the soil pH.

5476. Wang, S.-C., Lai, T.-M., and Yang, C.-C.
Liming as a means to increase sugar-cane yield in Taiwan.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 556-64, bibl. 38.

On account of their low buffering capacity the sandstone alluvial soils used in Taiwan for growing cane rapidly become acid. Long-term field experiments have shown that a 20% increase in yield could be obtained by liming, the beneficial effect persisting into the 4th crop.—Taiwan Sugar Exp. Stat.

5477. Evans, H.
Elements other than nitrogen, potassium and phosphorus in the mineral nutrition of sugar cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 473-507, bibl. 83, illus.

The physiological role, deficiency symptoms and critical levels of Ca, Mg, Fe, Mn, Cu, Zn, B and Mo in sugar cane are discussed, and the relevant literature is reviewed.

Sugar cane—diseases.

5478. Antoine, R.
Studies on chlorotic streak disease of sugar cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1091-7, bibl. 14.

Experiments are described, which confirm that the disease is confined to humid zones or water-logged soils, and that transmission is within the soil and not air-borne. [See also *H.A.*, 31: 3447.]—Mauritius Sugar Ind. Res. Inst.

5479. Ocfemia, G. O., and Nuque, F. L.
Gibberellin stimulates growth of sugar cane plants affected with Fiji disease.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1045-6, bibl. 1.

There was a conspicuous increase in leaf length 2 weeks after application.

5480. Azab, Y. E., Mills, P. J., and Chilton, S. J. P.
Studies on the recovery of sugarcane seedlings from mosaic.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1050-3, bibl. 1.

The natural recovery of canes, successfully inoculated in the seedling stage with mosaic, in both plant cane and first ratoons was sufficient to provide some material good enough for selection, but at a far lower percentage than from seedlings which did not develop mosaic.—La agric. Exp. Stat., Baton Rouge.

5481. Schexnayder, C. A.
The use of a sugarcane "test plant" as a means of detecting the presence of ratoon stunting disease in sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1068-71, bibl. 5.

Inoculation of disease-free single-eye pieces of variety C.P. 36-105 with juice from 7 varieties, both clean and diseased, resulted in practically 100% accuracy of prediction.—U.S.D.A.

5482. Antoine, R.
Note on the tetrazolium test for detecting ratoon stunting disease in sugar cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1042-5, bibl. 4.

D.109 gave consistent positive reactions, using mature or nearly mature stalks, and with M.134/32 the results were fairly consistent. With M.147/44 the correct age for sampling has not yet been ascertained, and with 7 other varieties no response was obtained.—Mauritius Sugar Ind. Res. Inst.

5483. Fife, J. M., and Stokes, I. E.
Amino acid changes identify ratoon stunting disease.
Sugar y Azúcar, 1959, **54**(11): 27-8, bibl. 3, illus.

The contents of aspartic acid, glutamic acid, serine, glycine, threonine, citrulline and an unidentified amino acid were higher in the leaves of plants infected with ratoon stunting disease than in healthy plants.—Agric. Res. Serv., U.S.D.A.

5484. Barrie, A. G.
Some factors affecting the germination of cane after hot water treatment.
Proc. 26th Conf. Qd Soc. Sugar Cane Tech., 1959, 1959, pp. 93-103, bibl. 17.

Germination after long hot water treatment (50° C. for 3 hours for control of ratoon stunting disease) increased from 4 to 87% from June to September using cane from the same fields. Top setts of non-arrowed stalks gave outstanding germinations in September and November after the treatment. Cane from outside rows was more resistant to damage by the treatment than cane from inside rows. Evidence is presented to show that, once a "good" source of plants has been located from early treatments, it would be advantageous to utilize this for future treatments. The level of nutrition and type of crop did not appear to be major factors in accounting for the difference in resistance to damage by the treatment. Variable results were obtained by using whole stalks instead of setts. Rapid cooling after removal from the hot water was not beneficial but was damaging in one instance. Keeping the cane damp for a period after the treatment and before planting was also damaging. It was found that, in September, treated cane was not more sensitive to dry conditions than untreated cane as regards germination. The auxin content of the stalks is postulated as being the factor most likely to be responsible for differences in resistance to damage by long hot water treatment, although temperature and maturity cannot be dismissed. [From author's summary.]

5485. Han Lioe Hong.
Ratoon stunting disease in Java; effect of long hot water treatment on germination.
Rep. Exp. Stat. Java Sugar Ind., 1960, No. 1, from abstr. in *Sugar y Azúcar*, 1960, **55**(11): 50.

Hot water treatment for 2 hours at 50° C. caused the lateral buds to become tender and soft, especially in the younger setts. Where this treatment is required, setts of P.O.J. 3016 should be more than 8 months old and those of P.O.J. 3067 not less than 7 months old. Of the 3 setts cut from the top of the stalk, that containing eyes 3 and 4 was the most resistant to the treatment.

5486. Steib, R. J., and Chilton, S. J. P.
Control and rate of increase of the ratoon stunting disease in hot-air treated sugarcane in Louisiana.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1061-6, bibl. 4, illus.

Examination of fields of treated cane showed 4·5% to be diseased, thus indicating failure to give the correct treatment in a few individual cases. The rate of increase in disease incidence in treated cane following one cutting was 4 to 1 in both plant and 1st ratoon crops; but in cane with a higher general level of disease the increase was only 2 to 1. The pink discolouration of the growing point of primary shoots was not so accurate a diagnostic symptom as the orange-red discolouration of the vascular bundles of the mature canes.—La agric. Exp. Stat., Baton Rouge.

5487. Hughes, C. G.
Striate mosaic: a new disease of sugar cane.
Nature, 1961, **190**: 366-7, bibl. 2.
Striate mosaic.
Cane Grs' quart. Bull., 1961, **24**: 142.

Apparently 2 viruses are involved, causing striations and stunting, respectively. The disease is seed-transmitted. Heat treatment of setts, as for the control of ratoon stunting disease, was ineffective. The disease spreads slowly in the field and the use of clean planting material should provide adequate control. Pindar and Q.57 are susceptible varieties.—Bur. Sugar Exp. Stats, Brisbane.

5488. Martin, J. P., and Wismer, C. A.
Two unrecorded leaf disorders of sugar cane in Hawaii.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1046-50, illus.

Leaf stipple and ring mosaic with symptoms similar to those observed in Java.

5489. Hayward, A. C.
Gumming disease of sugarcane.
Commonw. phytopath. News, 1961, **7**: 1-2.

Brief notes on the distribution of *Xanthomonas vasculorum* and cane varieties susceptible to it, and on other bacterial diseases in the Indian Ocean area.

5490. Egan, B. T.
Problems in pineapple disease control.
Cane Grs' quart. Bull., 1961, **24**: 135-6, illus.

A summary of the essential points in controlling pineapple disease by mercurial dips or sprays.

5491. SKINNER, S. O.

Mercurial treatment of cane stalks: wetting the vehicle load.

Proc. 26th Conf. Qd Soc. Sugar Cane Tech., 1959, 1959, pp. 85-7.

Treatment of the planting material with a proprietary preparation containing ethoxy ethyl mercuric chloride, intended for the control of pineapple disease (*Ceratocystis paradoxa*), markedly stimulated germination. It is considered best to treat the setts, but, if the disease is not very prevalent, the stimulating effect may be achieved by spraying the stalks in bulk. A trial is described in which the stalks were sprayed in 3-ton loads on a lorry. The germination rate was doubled and the need for supplying was greatly reduced.

5492. EGAN, B. T.

A preliminary report on the control of yellow spot disease by dusting with copper oxychloride.

Proc. 27th Conf. Qd Soc. Sugar Cane Tech., 1960, 1960, pp. 145-8, bibl. 3.

Weekly dustings against *Cercospora köpkei* were started on 16 January and ended in mid-April. On 26 June the percentage of effective leaf area on the treated plants was over 80 compared with 27–38 on the controls, and the C.C.S. increased to 8·0–8·7 as compared with 6·0–6·3. On 21 August the comparable leaf area figures were 80 and 58 and the C.C.S. 13·0 and 12·25, respectively.—Bur. Sugar Exp. Stats, Gordonvale.

5493. JOLY, S., AND GAMBOGI, P.

Brevi notizie e qualche ricerca sulla biologia di *Colletotrichum falcatum* Went. agente del marciume rosso della canna da zucchero. **(Brief notes and some investigations on the biology of *Colletotrichum falcatum*, agent of red rot of sugar cane.)** [French summary 9 lines.]

Ann. Fac. Agrar. Pisa, 1957, **18**: 111-30, bibl. 149, illus.

Including a comparison of the effects of ferbam, dithane, RS-406 and Karathane on cultured colonies.

5494. SINGH, V. B., AND SINGH, K.

Formation of red rot acervuli on the nodes and within the tissues of diseased canes.

Curr. Sci., 1961, **30**: 63-4, bibl. 3, illus.

Discovered in the course of variety susceptibility trials.

5495. AZAB, Y. E., AND CHILTON, S. J. P.

Inheritance of resistance and susceptibility of sugarcane to the red rot fungus (*Physalospora tucumanensis* Speg.).

Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1127-9, bibl. 2.

In inoculation tests on 1,455 seedlings from 14 crosses the degree of resistance in the parents made little difference to the percentage of resistant seedlings.—La St. Univ., Baton Rouge.

5496. WISMER, C. A.

A promising new fungicide for the control of *Pythium* root rot of sugar cane seedlings in flats.

Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1133-6, bibl. 4, illus.

B.22555 (p-dimethylaminobenzenediazo sodium sulphonate) was very effective when applied as a drench at 500 p.p.m.

5497. CHU, T. L., LEU, L. S., AND BAU, Y. S.

Progress report on the study of the mode of resistance of genus *Saccharum* and its relatives to downy mildew.

Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1098-1107, bibl. 4.

In tests on 700 varieties of sugar cane and related species 20% proved to be highly resistant and 20% susceptible to *Sclerospora sacchari.* The varieties of *Saccharum sinense* and *S. barberi* were more resistant than those of *S. officinarum* and *S. robustum*, and all *S. spontaneum* varieties were highly resistant. [See also *H.A.*, 29: 3038.]—Taiwan Sugar Exp. Stat.

Sugar cane—pests.

(*See also* 5179, 5570.)

5498. MOLLER, R. B.

Varietal response to Nemagon fumigation.

Cane Grs' quart. Bull., 1961, **24**: 123-4, illus.

Of 13 varieties tested Q.68 and Pindar have shown no beneficial response to Nemagon treatment in the early stages of the crop. There was a very marked depression of growth in untreated plots of Q.63 and Q.58, and to a lesser degree in C.P.29-116, Q.47 and Q.61. With Q.70, Co.290, Q.71, Q.50, N.Co.310 and Vesta there was an obvious but smaller improvement following fumigation.

5499. WILSON, G.

Screening soil insecticides against white grubs.

Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 978-81.

BHC dust at 4-32 p.p.m. was outstanding against *Lepidiota consobrina* L. sp. nov. (Mossman grub), *L. frenchi*, *Pseudoholophylla furfuracea* (Childers grub) and *Dermolepida albohirtum* (greyback grub). With BHC mortality increased with concentration, whereas with less effective compounds no such relationship was found.—Qd Bur. Sugar Exp. Stats.

5500. FLORES, S., AND GONZALEZ, A.

Sugarcane stalk weevil (*Cholus morio* Champ.).

Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 982-7, bibl. 8, illus.

The life history of this Mexican pest is described.

Applications of BHC, aldrin and dieldrin dusts, repeated after 14 days, have shown promise.—Inst. Mejor. Prod. Azúc., Mex.

5501. Ellis, T. O., Röhrig, P. E., and Arceneaux, G.
Stalk borer damage as affecting available sucrose in mill cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 924-36, bibl. 4, illus.

Damage by *Diatraea saccharalis* decreased the pol. % normal (absolute) juice, the purity of the normal juice and the normal juice extraction percentage and increased the fibre percentage. The first 2 effects accounted for an average decrease of 0·854% of available sucrose in the cane in the studies described.—South Puerto Rico Sugar Co., La Romana, Dominican Rep.

5502. Box, H. E.
Status of the moth borer, *Diatraea saccharalis* (F.), and its parasites in St. Kitts, Antigua and St. Lucia; with observations on Guadeloupe and an account of the situation in Haiti.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 901-14, bibl. 12.

In St. Kitts, some 20 years after the start of biological control, *Lixophaga diatraeae* had reduced infestation to a third of that prevailing in 1932–33, and in Antigua to a little under half. Parasitization by *Metagonistylum minense* in St. Lucia averaged 36%. In Haiti *L. diatraeae* had reduced infestation by 50% since 1953.

5503. Simmonds, F. J.
The successful biological control of the sugarcane moth borer *Diatraea saccharalis*, F. (Lepidoptera, Pyralidae) in Guadeloupe.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 914-18, bibl. 6.

The introduction of *Lixophaga diatraeae*, *Metagonistylum minense* and, later, *Paratheresia claripalpis* resulted in a reduction of borer infestation from 12·81% in 1949 to 2·53% in 1957, by which time *P. claripalpis* had become the most effective parasite.—Commonw. Inst. biol. Control, Ottawa.

5504. Risco, S. H.
Combatting the borer in Peru. Success of the campaign of biological control.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 877-86, bibl. 7.

Using *Paratheresia claripalpis* against *Diatraea saccharalis* [see also *H.A.*, 29: 1958].

5505. Scaramuzza, L. C.
Damage by the sugarcane borer in Louisiana and Cuba. The importance of biological control.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 938-41, bibl. 5.

The difference between the degree of infestation by *Diatraea saccharalis* in Louisiana (22%) and in Cuba (12–15%) is attributed to the numerous parasites and predators in Cuba, whereas in Louisiana only the egg parasite *Trichogramma minutum* is present.

5506. Charpentier, L. J., McCormick, W. J., and Mathes, R.
Biological control of the sugarcane borer in Louisiana.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 865-9, bibl. 4.

Of the various introductions made since 1915 only the Amazon fly, *Metagonistylum minense*, and the Cuban fly, *Lixophaga diatraeae*, have shown the ability to survive the field conditions and winters of Louisiana, but neither has increased sufficiently to control *Diatraea saccharalis*.—U.S.D.A.

5507. Questel, D. D., and Bregger, T.
Internal temperatures in preharvest burned cane and mortality of the sugarcane borer.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 921-3, bibl. 1.

Temperatures, mostly well in excess of 125° F., were reached in the tops of several varieties of cane burned before harvest, when the crops were 40 tons per acre or more, and the mortality of borer larvae under these conditions is thought to be extremely high.—U.S.D.A. and Univ. Fla.

5508. Gupta, B. D., and Avasthy, P. N.
Biology and control of the stem borer, *Chilo tumidicostalis* Hmpsn.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 886-901, bibl. 7, illus.

Mechanical measures, light trapping, removal of infested tops and collection of egg masses have proved effective; chemical control much less so [see also *H.A.*, 31: 1570]. *Trichogramma evanescens minutum* parasitized 30–71% of the eggs between August and October and *Apanteles flavipes* 16–35% of the larvae in July and August. Small numbers of an unidentified wasp parasite were also collected.—Indian Inst. Sugarcane Res., Lucknow.

5509. Kampf, H.
Aerial spraying of sugar cane in Pakistan.
Pest Technol., 1960, **2**: 162-3, bibl. 1, illus.

Leaf-hopper (*Pyrilla perpusilla*) control using endrin e.c. applied from Beaver aircraft.

5510. Beardsley, J. W.
Observations on sugar cane mealybugs in Hawaii.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 954-60, bibl. 10.

Of the 5 mealybug species attacking sugar cane in Hawaii the pink (*Saccharicoccus sacchari*) and the grey (*Dysmicoccus boninsis*) are the most important.

The populations are kept down to moderate levels by the adults and larvae of several coccinellid beetles, the larvae of a drosophilid fly, 2 encyrtid wasps and 2 entomogenous fungi.—H.S.P.A., Honolulu.

5511. Singh, H., Kalra, A. N., and Sidhu, A. S.
Sugarcane mite and its control.
Indian J. Sugarcane Res., 1961, **5**: 92-5.

The application of 100-200 lb. N acre induced heavy infestation by *Paratetranychus indicus*. P and K had no such effect. More frequent irrigations in the pre-monsoon period tended to reduce infestation. For control lime-sulphur wash (1:6 dilution) proved superior to DDT, BHC, endrin, dieldrin and malathion.—Sugarcane Res. Stat., Jullundur.

5512. Agarwal, R. A.
The sugarcane scale *Melanaspis* (*Targionia*) *glomerata* (Green), its biology and control.
Indian Sugar, 1960, **10**: 523-6, 537-44, bibl. 13, illus.

Folidol e.c. at 0·04% reduced the scale population by 80% and eliminated the crawlers within 48 hours. [For biological control, see *H.A.*, 30: 1394.] —Sugarcane Breeding Inst., Coimbatore.

5513. Gupta, B. D.
Studies on the control of termites in sugarcane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 961-77, bibl. 16.

Chlordane, aldrin and BHC proved very satisfactory for preventing termite damage when applied as dusts at 1 lb. a.i. per acre. Dipping the setts in 0·25-0·5% suspensions or emulsions of these compounds and of dieldrin also protected the eyes and resulted in better germination. Chlordane had additional hormonal effects, which increased yields. Aldrin, alone or with organo-mercury compounds, persisted throughout the crop season. —Indian Inst. Sugarcane Res., Lucknow.

5514. Volp, P.
Rat bait trials in the Mulgrave area.
Proc. 27th Conf. Qd Soc. Sugar Cane Tech., 1960, 1960, pp. 155-7.

Baits of whole wheat coated with thallium sulphate were taken more readily when these were machine-packed in polythene or glassine paper than when they were packed by hand. Spraying with raw linseed oil increased the number of takes in both hand and machine packs, particularly the latter. —Mulgrave Cane Pest Disease Contr. Bd, Gordonvale.

5515. Doty, J. W.
Rodent control in commercial cane areas of Florida Everglades.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 1011-15, bibl. 11.

The practice of burning the cane before harvest has made a major contribution to keeping the rat population within limits. The ideal poison bait has not yet been found, since the cost of using the anti-coagulant rodenticides is prohibitive.—U.S. Sugar Corp., Fla.

Sugar cane—yields, harvesting, composition and by-products.

(*See also* 5469, 5501.)

5516. de Sornay, A., and Davidsen, O.
Relationship between growth of sugar cane and yield of cane at harvest.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 390-8, bibl. 2.

Linear relationships were found between the yield estimated from stalk elongation and from the weight of small random plots on the one hand, and the actual average crop yield on the other. Both gave correlations of a high order, but the individual differences were smaller when random plot weights were used.—Mauritius Sugar Ind. Res. Inst.

5517. Barrie, A. G.
Variations in the yield of farms with equal potential in the Mulgrave area.
Proc. 27th Conf. Qd Soc. Sugar Cane Tech., 1960, 1960, pp. 159-65, bibl. 2.

Of the 2 components affecting the yield of sugar per acre, the weight of cane per acre had five times the variation of the C.C.S., which indicated that farming practice had little effect on the latter, but a considerable effect on the former. A close positive correlation was found between the yield of cane and of sugar per acre, but a negative correlation between the latter and the C.C.S. The implications of these findings are discussed.

5518. Chou, J. C.
Effect of trash on cane milling.
Taiwan Sugar. August 1960. p. 13. from abstr. in *S. Afr. Sugar J.*, 1961, **45**: 66-7.

Milling results are given in full for the extraction of cane of 3 types, viz. topped and thoroughly stripped, topped and cleaned as usual, and topped but not cleaned. Increased trash content caused a reduced extraction rate, a fall in the purity of primary juice and reduced grinding capacity.

5519. Duncan, R. A.
The mechanical harvesting of long crop sugar cane.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 613-20, illus.

Tests on 27 types of self-propelled cane-cutter and harvester tried in Hawaii since 1906 are reviewed.

5520. Turner, A. W.
Deterioration of cane quality with time after cutting at San Cristobal, Veracruz, Mexico.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 603-11, bibl. 13.

Data are presented which show that the percentage loss of weight of cane cut and left in the field increases with time as the age of the cane increases, although there were no definite correlations between percentage loss, age of cane and yield. There is also a decline in juice purity, slow for the first 5 days, then increasing to 1½ points per day 9–21 days after cutting.—Inst. tec. Azuc., Veracruz.

5521. BARTLETT, G. S.
Motorising sugarcane transport.
Condenser, reprinted in *S. Afr. Sugar J.*, 1961, **45**: 112-17, illus.

A review of developments in South Africa, covering trailers, mechanical loading and personnel training.

5522. RAO, K. C., AND AIYAR, K. V. G.
Fluctuation of starch in Co. 419, Katha, S.S. Assam 301 and *Erianthus arundinaceous* at different stages of growth.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 841-3, bibl. 14.

Consistently highest in *Erianthus* and lowest in Co. 419.

5523. AIYAR, K. V. G., AND RAO, K. C.
Studies on the relation of the chemical composition of cane juices and the quality of jaggery with special reference to the new Co. canes.
Proc. 10th Congr. int. Soc. Sugar Cane Tech., Hawaii, 1959, 1960, pp. 825-9, bibl. 13.

Analytical data of the juice and jaggery from 42 new Co. canes are tabulated. Good jaggeries appear to result from juices with low amino-acid nitrogen, and the setting time of such jaggeries is short.—Sugarcane Breed. Inst., Coimbatore.

5524. BANDI, B. B.
Improving the quality of bagasse for its fuel value.
Indian Sugar, 1960, **10**: 599.

Bagasse with a moisture content of 47–48% held at 180° C. for 1 min. lost 15% in weight. A device resembling a sugar drier is very briefly described, in which the bagasse may be dried under sealed conditions to prevent it catching fire.

5525. OWEN, W. L.
Colored bagasse, an ideal product for mulching.
Sugar y Azúcar, 1960, **55**(11): 45.

Weathered bagasse is marketed as a mulching material in commercial horticulture. This article describes a method of producing the desired dark colour by use of a metallic oxide plus a mordant. This process is claimed to be cheaper and to produce as good a material as the normal method of weathering in the field.

5526. LA XUAN VINH AND VILLANUEVA, L. J.
The organic matter, crude wax, total nitrogen, P_2O_5, and CaO contents of filter press cakes from ten sugar centrals in the Philippines.
Philipp. Agric., 1960, **44**: 236-46, bibl. 21.

Investigations suggest that filter press cakes may be utilized as a fertilizer, a soil conditioner, possibly for livestock feed and as a source of a medium hard, commercial wax.

5527. OWEN, W. L.
Optimum utilization of filter press muds.
Sugar y Azúcar, 1960, **55**(7): 27-8, 49, bibl. 8, illus.

A mechanical composter is described, which turns the material at intervals, aerating it by the use of air spargers. An initial inoculation is made with specially prepared cultures, coarsely ground cane trash or bagasse is added mechanically and the material is maintained at its optimum moisture content. Warm air is supplied to the mass, especially at the beginning.

Tea—propagation and culture.

5528. GREEN, M. J.
Tea seed baries in East Africa.
Tea, 1961, **2**(2): 23-5.

To obtain a maximum yield of seed the trees should be spaced at about 20 ft. apart so that they just touch. Areas of plucked tea may be allowed to run to seed while a barie of selected seedlings is coming into bearing. Plucked bushes selected for seed-bearing should have a high density of plucking points and strong shoots without erect leaves, and should be pruned to leave 6 branches dispersed through the bush surface. Fertilizer, at 80 lb. N plus 40 lb. P_2O_5 per acre, should be applied until a barie is in bearing when a 3:2:1 N:P:K mixture should be used.—Tea Res. Inst., E. Africa.

5529. BARUA, D. N.
The significance of seed-size in cultivated tea (*Camellia sinensis* L.).
Emp. J. exp. Agric., 1961, **29**: 143-52, bibl. 4.

Tea seed size is a characteristic of the mother tree; the pollen parent seems to have little, if any, effect on it. Manuring a tea seed orchard with N and NPK reduces the number of small seeds. The pattern of size distribution of seeds varies from one orchard to another. The size of the resulting seedling is related to the size of the seed. Seedlings raised from small seeds start with an initial disadvantage, which justifies the rejection of very small seeds. Smallness, however, should be judged with reference to the most frequently occurring seed size in an orchard. Seeds of the modal size grade tend to give the highest percentage germination. The practice of using a common, arbitrarily chosen mesh for sieving out small seeds is discouraged, as it may cause an unnecessary loss of good seeds. [From author's summary.]—Tocklai exp. Stat., Cinnamara, Assam.

5530. G[REEN], M. J.
Vegetative propagation: preparation and use of pretreated cuttings.
Ser. Tea Res. Inst. Tocklai **154**, 1960, pp. 3.
Pre-treatment consists in keeping the cuttings in standard propagation nurseries until a protective layer of callus is formed over the basal cut about 4 weeks after planting. The cuttings can then be packed in polythene tubes and transported without serious desiccation. Recommendations are given for packing and planting. [See also *H.A.*, 31: 1589.]

5531. DUTTA, S. K.
Care of tea in droughty areas.
Reprint from *Comm. Times, Calcutta*, 1960, pp. 4.
Advice on irrigation, shading, pruning, tillage and mulching.

5532. D[UTTA], S. K., G[LOVER], P. M., AND S[ARMAH], K. C.
Hail damage on tea estates.
Ser. Tea Res. Inst. Tocklai **36/3**, 1960, pp. 4.
To prevent subsequent infection by *Nectria* sp. and *Macrophoma theicola* hail-damaged trees should be sprayed immediately with a copper fungicide plus spreader. The plucking table should be raised 10–15 cm. in young tea and at least 5 cm. in mature bushes. Additional fertilizer, preferably a NPK mixture, should be applied after most of the bushes have put out at least 2 new leaves.

5533. CHILD, R.
The effects of fertilizer applications on tea soils.
Pamphl. Tea Res. Inst. E. Afr. **17**, 1960, pp. 49-59, bibl. 4.
The effect of soil pH on tea and the influence of fertilizers on soil pH are discussed. Tea can grow on soils with a pH as low as 3·8 and can accumulate Mn and Al to levels which are toxic for most other plants.

5534. FLÉMAL, J.
La fumure du théier au Kivu. **(Manuring tea in Kivu.)**
Bull. agric. Congo, 1960, **51**: 807-32, bibl. 22.
The nutrient requirements of the tea bush in respect of N, P, K, Mg, S and Ca are discussed, and the importance of the minor elements Fe, Mn, B, Cu and Al is noted. The effects of green manuring, shade trees and composting are described. Recommendations are made for both plantations and nurseries on the various soil types of the Kivu district.

5535. MULDER, D., AND VISSER, T.
Nitrogen deficiency in clonal plants.
Tea Quart., 1960, **31**: 153-5, bibl. 3, illus.
Plants of the vigorously growing clone TRI 2024 often develop a typical pinkish-yellow flush, which may be cured completely by a urea spray. The N deficiency symptoms are illustrated in colour.

5536. MEDLEY, V. F.
Preventive weed control in tea.
World Crops, 1961, **13**: 103-5, illus.
Simazine 50W, applied at the rate of 2 lb. w.p./acre, maintained residual weed control until 10–20 in. of rain had fallen, and until 15–40 in. had fallen when it was applied at 4 lb./acre. A further application was necessary as soon as the soil residue was exhausted and before the seeds had grown beyond the seedling stage. Both broad-leaved weeds and grasses were controlled, although a few, named species were partially resistant.

5537. HOWARTH, N. L.
Notes on dalapon spraying for couch control in tea on Jamji estate.
Pamphl. Tea Res. Inst. E. Afr. **17**, 1960, pp. 20-2.
Dalapon at 10 lb. to 100 gal. water per acre successfully controlled couch grass. One overall spraying and 3 spot applications were made in 1 year. Phytotoxic effects on the tea were slight.

Tea—diseases and pests.

5538. ELIAS, A. L.
Motorized knapsack mistblowers.
Tea Quart., 1960, **31**: 169-71.
Five proprietary mistblowers applying 4–6 oz. copper fungicide (50% w.p.) in 2 gal. water/acre were tested; all gave good control of blister blight.

5539. GOODCHILD, N. A.
Recent work on *Armillaria mellea*.
Pamphl. Tea Res. Inst. E. Afr. **17**, 1960, pp. 27-36.
In some cases ring barking the shade trees *Grevillea robusta* and *Acrocarpus fraxinifolius* to control *Armillaria* actually gave rise to serious outbreaks. The ringing was probably too deep and killed the trees before depleting the roots of starch. Similarly, felling can produce outbreaks. Work on arboricides and on chemical ring-barking with both sodium chlorate and 2,4-D is in progress. [See also *H.A.*, 31: 3519.]

5540. AGNIHOTHRUDU, V.
Rhizosphere microflora of tea (*Camellia sinensis* (L.) O. Kunze) in relation to the root rot caused by *Ustulina zonata* (Lév.) Sacc.
Soil Sci., 1961, **91**: 133-7, bibl. 8.
Quantitatively there were significantly higher numbers of bacteria and fungi in the rhizosphere of tea infested by *U. zonata* than in the rhizosphere of apparently healthy plants or in the soil away from the roots. Diseased plants yielded 50 species of fungi, whereas apparently healthy plants and

control soil gave 32 and 14 species, respectively. The larger number of fungi per g. of moisture-free soil in the case of diseased plants is attributed to increased sporulation of predominant fungi. Chromogenic, proteolytic, gram-negative, non-sporing forms were more abundant in the rhizosphere of apparently healthy plants than in the control soil. In the rhizosphere of healthy plants there were proportionately higher numbers of bacteria capable of maximum growth in the simple basal medium, whereas in the control soil and rhizosphere of infected plants there was a greater percentage of bacteria requiring soil extract and yeast extract. The qualitative composition of the bacterial population of the rhizosphere of diseased plants and control soil was very similar, although the numbers were much greater in the former. [Author's abstract.]—Tocklai exp. Stat., Cinnamara, Assam.

5541. Cranham, J. E., and Fernando, E. F. W.
Biology and control of the fringed nettle grub (*Macroplectra* (*Natada*) *nararia* Mo.).
Tea Quart., 1960, **31**: 156-64, bibl. 12, illus.

Spraying infested bushes with a suspension of the wilt or granulosis virus disease caused infection of the grubs and reduced their numbers considerably, but the virus did not persist on the foliage so as to infect a second generation. DDT, 0·1% emulsion and 0·2% w.p., and malathion, 0·1% emulsion, gave good control. A field-scale trial with 1 lb. actual DDT per acre, high or low volume, gave a rapid kill of grubs, but the use of DDT on tea cannot be generally recommended at present.

5542. Newton, A. P.
Control of shot-hole borer with Dieldrex.
Tea Quart., 1960, **31**: 172-5.

Spraying bushes, once after pruning and again before bud-break, with 2 pints Dieldrex in 60 gal. water per acre reduced infestation and gave increases in yield of 600 lb. made tea per acre. Spraying with dieldrin may, however, lead to attacks of tortrix, because the natural parasite population is reduced.

5543. Oei Hong Peng.
Antagonistic effects on the growth of young tea plants caused by gibberellin and some sucking insects. [Indonesian summary ¼ p.]
Menara Perk., 1960, **29**: 183-9, bibl. 11, illus.

Spraying young tea infested with *Toxoptera aurantii* or *Pseudococcus filamentosus* with GA at 50 p.p.m. did not counteract the reduction in growth caused by the insect attack. The spray, however, did reduce the number of insects infesting the plants. GA at this dilution produced stem elongation, an increase in leaf size and chlorosis, but it did not reduce the root system or cause wrinkling of the leaves. Attacks by *T. aurantii* had an elongating effect on the lateral roots.—Res. Inst. Estate Crops, Bogor.

Tea—quality and composition.

(*See also* 3623.)

5544. Child, R.
The tea taster and the chemist.
Pamphl. Tea Res. Inst. E. Afr. **17**, 1960, pp. 37-48.

The relationships between tea quality and composition are discussed. Fermentation consists in the oxidation of epi-gallocatechin and its gallate by polyphenol oxidase, which is probably a protein copper complex associated with the choroplast. [See also *H.A.*, 31: 3533.]

5545. Roberts, E. A. H., and Smith, R. F.
Spectrophotometric measurements of theaflavins and thearubigins in black tea liquors in assessments of quality in teas.
Analyst, 1961, **86**: 94-8, bibl. 8.

A spectrophotometric method for determining theaflavin is described. This method also yields an approximation of the total thearubigin content, and the ratio of optical-density values for thearubigins at 380 and 460 mμ provides a further parameter giving an indication of whether lightly or deeply coloured thearubigins predominate. [From authors' abstract.]—Indian Tea Ass., and J. Lyons & Co., Ltd., London.

5546. Zaprometov, M. N.
Isolation of quinic and shikimic acids from tea shoots. [Russian, with English summary ½ p.]
Biohimija, 1961, **26**: 373-84, bibl. 42, illus.

A detailed description is given of the method of isolation. The free quinic acid content of young, 3-leaved tea shoots was 1·5%, that of ester-bound quinic acid 1·0%, and that of shikimic acid 0·035% of the dry weight.

Sundry crops.

5547. Hernández-Medina, E., and Vélez-Santiago, J.
Response of the acerola (*Malpighia punicifolia* L.) to the application of lime and foliar sprays of magnesium and minor elements. [Spanish summary ½ p.]
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1960, 1960, **4** (8th annu. Mtg): 20-5, bibl. 8.

Applications of lime bringing the soil pH from 4·5 to 5·5 and 6·5 increased growth, yield and the ascorbic acid content of the fruit. Total acidity and ascorbic acid content were significantly correlated and reached a peak in fully developed green fruits, decreasing with increasing maturity. Foliar sprays of Mg and minor elements had no effect on yield or ascorbic acid content. [See also *H.A.*, 29: 4120.]—Univ. P.R., Rio Piedras.

5548. JOSHI, M. R., AND SOHONIE, K.
Amino acid constituents of palm *gur*.
J. sci. industr. Res., India, Sect. C, 1957, **16C**: 119-20, bibl. 11.

Data for palmyra and date palms.

5549. BOLT, A.
Chicle.
World Crops, 1961, **13**: 58-9, illus.

The tapping of wild *Achras sapota* trees is described. 200–300 trees yield about 1 ton of gum per season.

5550. HODGE, W. H.
The South American "sapote".
Econ. Bot., 1960, **14**: 203-6, bibl. 3, illus.

In N.W. South America the fruit of *Quararibea* (*Matisia*) *cordata* (fam. Bombacaceae) resembles that of the Central American *Calocarpum sapota* (fam. Sapotaceae). It grows mainly in lowland areas, and, in Ecuador and northern Peru, reaches a height of about 12 m. The time of flowering varies locally, fruits maturing about 8 months later. Fruits are the size of a large pear, with thick, leathery skins and sweet, rather fibrous, edible flesh.

NOTES ON BOOKS AND REPORTS.

Books.

(*See also* 4076.)

5551. AINSWORTH, G. C.
Ainsworth and Bisby's dictionary of the fungi.
Commonwealth Mycological Inst., Kew, 5th edition 1961, 7½ × 5 in., pp. 520 + xiv, illus., 30s.

The previous edition of this comprehensive, yet very compact, handbook was published in 1954, and much new material has now been added comprising over five thousand corrections or alterations to the text. In addition to the dictionary itself, in which genera, mycological terms, biographical notes and short reviews of important mycological subjects are included, the book contains details of the systematic arrangement of the fungi, a key to the families and a series of figures illustrating fungal structure and behaviour. This scholarly compendium is the product of an immense labour and now provides an essential reference book for all workers in those biological and agricultural sciences in which fungi are of importance.

5552. BALFOUR, A. P.
Annual and biennial flowers.
Penguin Books, Harmondsworth, 1959, 7 × 4½ in., pp. 261, illus., 6s.

Full practical instructions are given on the methods of growing annuals from seed in the open and under glass, the general problems of cultivation being solved in the opening chapters. The main part of the book consists of an alphabetically arranged descriptive list of practically every variety likely to be useful. These notes are comprehensive, telling all about the plant, the several methods of treatment (there is nearly always more than one, annuals being the garden maids-of-all-work), the purposes to which each variety is most suited and sufficient advice to ensure that the plant will be made to give of its best in its short life. A chapter on how new garden varieties have arisen is disappointingly brief, although the few case histories given are packed with interest. The remarkable sequences resulting in the accidental evolution of the delphinium Pink Sensation (*D. nudicaule* × *D. elatum*) reads like one of the better who-dunnits. Another chapter that stops frustratingly too soon is that on the ingenious techniques of seed collection and after-treatment as used by professional growers. (The revolving drum equipped with needles for impaling peas via the holes left by the pea weevil sounds pure Heath Robinson.) But as the purpose of the book is to give practical instruction in cultivation these chapters must rank as digressions. The illustrations are admirable.

G.St.C.F.

5553. BRITISH WEED CONTROL COUNCIL (WOODFORD, E. K., EDITOR).
Weed control handbook.
Blackwell, Oxford, 2nd edition 1960, 9 × 6 in., pp. vii + 264, illus., 17s. 6d.

This early revision of the handbook first published in 1958 [see *H.A.*, 29: 1985] has been necessitated by the rapid developments in chemical weed control during the last two years and is most welcome. While retaining the general outline of the first edition, some of the sections have been rearranged, thus making this practical reference book still more convenient to consult.

The all-important problem of crop tolerance has been emphasized by assembling the relevant data in a separate new chapter. Another innovation in this part of the book is the introduction of the term *for information*. Whereas in the previous edition only firm and tentative recommendations for weed control in particular crops were made, treatments now described in paragraphs marked *for information* indicate developments which show promise and are bound to be of interest to progressive growers and others concerned with improved methods of controlling weeds.

Notes on herbicides used in Great Britain have also been extended by the inclusion of such new favourites as amino triazole, simazine and the British compound diquat. The old friend of the farmers, sodium arsenite, has become a foe, and recommendations for its use have been excluded. The approved list of common names for herbicides has been extended by 13 new entries, and in the table of properties of herbicides there are now 71 compounds compared with 56 in the earlier work.

E.U.

5554. CHAPPLE, F. J.
The heather garden.
Collingridge, London, 2nd edition, 1960, 9 × 6 in., pp. 160, illus., 25s.

There are at least 200 varieties of heather grown in the gardens of Great Britain. The unseeing eye, to which all heathers looks alike (and with some reason—there are over 30 named white varieties of the common ling) might well raise a brow and question why? And answer came there none? Not at all. In his stimulating book Mr. Chapple comes up with a great variety of answers, nearly as many as there are heathers in fact, ranging from the general to the particular, from the how, when and where to detailed accounts of individual plants.

In the course of the book a number of alleged fallacies are given rough handling. The most pernicious and the most universally believed is that heather, *E. carnea* excepted, can only be grown on a lime-free soil. This hoary legend has inhibited heather planting in many a garden in which the plants could have been perfectly happy. The author tries to kill this belief with harsh words reinforced by his own life-long experience. But tradition is immortal; that ghost will walk again. Of course heathers don't actually *like* lime. It is just that in a properly conditioned soil lime does not seem to matter. Talking of soils versus peat, the author exclaims, "Give me loam every time." All this seems very promising and to seal the promise there is an instructive chapter on how, if the soil should be reluctant to grow heathers through too recent liming or natural cussedness, it can quickly be brought to reason without much effort or—important this—expense. There are the necessary chapters on management and propagation, planting schemes and indeed on everything else connected with the cult. A great number of kinds are described, and described here includes anything of interest about the variety, its origin where known, its habits, soil preferences, flowering period and what the author thinks of it.

That the book is now in its second edition is proof that it is well established and indeed, quite apart from its obvious handbook value, it is very readable. Though an occasional breezy archness may curdle the blood of some, others will find it warming. The personality of the author pervades the book—it is essentially friendly. The illustrations are clear and serve their purpose well enough.

G.St.C.F.

5555. COOKE, G. B.
Cork and the cork tree.
Pergamon Press, Oxford, 1961, 9 × 6 in., pp. 121, bibl. 78, illus., 50s.

Literature on the cork oak, *Quercus suber*, and its production and products, is meagre and this appears to be the first time that a comprehensive, though admittedly thin, treatise has been devoted to it in English. Natividade's *Subericultura* [see *H.A.*, 21: 2130] is the standard work, but, by reason of its language, is more likely to be admired than consulted by the English speaking forester or horticulturist. Cooke, in compiling the present work, has not only made considerable use of publications of Natividade and others, but writes also from his own 30 years' experience with cork, cork trees and the cork industry.

Quercus suber is not an ephemeral creature producing quick returns and then vanishing. Far from it, for in an atomic age it is refreshing to find a tree that will not start yielding its produce for 20 years but may then, given considerate treatment, continue to yield uncomplainingly for another 8 generations or 150 to 200 years. Not in the get-rich-quickly class it tends to encourage a belief in continuity. This little book—short as it is and giving succint information on present practice in the warmer states of the U.S.A., where the tree is now grown thanks to the efforts of a few enthusiasts who started the Cork Project about 20 years ago—this little book is, if by now you have taken a second breath, itself pleasantly but informatively discursive. In turn and at leisure it introduces you to cork and its use in classical times, which was strangely enough very similar to present-day cork—nothing to beat it for containing fine wines, although perhaps one would like to know why it sometimes succumbs to old port. Botany and natural growth are next considered and then the structure and physical and chemical properties which make cork so valuable for so many purposes. Next the author proceeds to discuss the manufacture of natural cork articles and the very numerous products made from the cork which remains after the completion of these articles. Such products comprise corkboard with its low thermal conductivity, its capacity for sound and vibration absorption, which allow it to be widely used for flooring and boarding ceilings and other places where insulation is essential. Production and trade data are given with special reference to imports into the U.S.A. The last third of the book is devoted to plantings and projects in the U.S.A. and to practical notes on planting and care from acorn to cork producer. Although the author notes the success of early vegetative propagation trials with cuttings in Georgia, the whole of his cultivation directions centre on propagation from acorns. If you want to plant for your grandchildren and live in a nice warmish climate here's your chance to learn the way.

D.A.

5556. HYAMS, E., AND JACKSON, A. A. (EDITORS). ***The orchard and fruit garden: a new pomona of hardy and sub-tropical fruits.*** Longmans, London, 1961, 13 × 10 in., pp. 208, several bibls plus one of 11 pp., illus., 10 guineas.

In the early days of this century, while dessert fruit appeared regularly on the tables of the well-to-do, the growing of it was generally left to the gardener. The owner might show you with pride his peach houses or his vinery but seldom—if ever—his orchard or the small fruits growing in some obscure corner of his kitchen garden. To-day all is different; the gardener has gone, and, while many grow fruit trees for profit, there is a host of amateurs who grow the fruits of the earth either because they like eating them or simply because they love growing fruit plants to perfection. Edward Bunyard dedicated his *Anatomy of dessert*, in the words of Sir Hugh Plat, "To all Gentlemen and Ladies, and all others delighting in God's Vegetable Creatures".

It is these last, whether they devote their week-ends to a small garden patch or struggle to maintain a fruit garden too large for them, by whom the appearance of a new pomona, devoted mainly to the fruits of England, will be regarded as an event. We must here and now congratulate the editors, who, although they claim authorship of but a few of its chapters, must have given much loving care to the production of this book; and we can only hope that many of those who will appreciate it most will be able to afford the necessary ten guineas to possess it for themselves.

For this is not the sort of book to take out of the library and read at a sitting, packed with information contributed by a team of experts as it is. Rather it is a book to take from its shelf beside other, older, well-worn pomonas on a winter's evening after a meal (in which, of course, fresh fruit in season, perhaps even accompanied by a glass or two of wine, has played its part) and browse over by the fireside, absorbing the details of the history and cultivation and perhaps savouring once again the gastronomic delight of the fine apple or pear that has recently been consumed.

That being so, this is not an easy book to review, and one can do little beyond describing its content—leaving the lovers of fruit themselves to pick out the chapters that interest them most for detailed reading. As might be expected, when each comes from the pen of a different author, the various chapters are rather uneven in quality, and one suspects that in some the personal predilections of the author have influenced his writings. While, in the years to come, some will be consulted over and over again by students and others wishing to learn the horticultural practices and varieties grown in this mid-twentieth century, others are too brief to provide much information. Indeed, one could wish that the editors had confined themselves to the fruits of this country or, at any rate, those of the temperate zone, for the few sub-tropical fruits—only two of them, the lemon and the banana, are deemed worthy of a chapter to themselves—might well have been omitted and more space allotted to some of the others. Thus that widely-grown fruit, the loganberry, receives scant attention.

Apart from this, all the fruits commonly grown in England, either in the open or under glass, are dealt with, including, rather cursorily, the tomato and the cucumber, by a band of experts too numerous to mention individually. But one wonders whether the order in which the chapters occur might not have been bettered—it is a little disconcerting to find general chapters on propagation and pruning sandwiched between the mulberry and the peach.

The selection of varieties for inclusion must have given a headache to several authors, particularly where there are very many from which to choose. Many well-known varieties of yesterday have disappeared, though others that few would plant to-day are still included; it seems a pity that some of the newer introductions, such as Tydeman's Early Worcester apple and Merton Pride pear, have been left out. It may take time finally to assess their merits, but that should not preclude a description of them in a pomona like this.

The illustrations are nearly all very good, though again they vary in merit, and a horrible basket of tomatoes opposite p. 146 might well have been dispensed with. Also, more attention might have been paid to the scale of some of the photographs; even in shows one seldom sees a sample of Kent Bigarreau cherry as large as that illustrated, whereas, in comparison, Merton Bigarreau looks like a wild mazzard. There is an excellent bibliography of books published in English on fruit-growing and a very useful index. There are a few obvious misprints, such as "Emdrin" (p. 73), which will doubtless be corrected in subsequent editions.

This is not a text-book on fruit growing—for fuller details of the cultivation of individual fruits students will look to the bibliography and to the many reports and bulletins such as are abstracted quarterly by the Bureau. But as an attempt to provide a broad picture of our times it may be warmly welcomed.

T.N.H.

5557. INDIAN CENTRAL TOBACCO COMMITTEE (PATEL, J. S., PATEL, M. S., AND OTHERS).
Indian tobacco: a monograph.
Indian Central Tobacco Committee, Ministry of Food and Agriculture, Madras, 1960, 10 × 7 in., pp. xviii + 413, bibls numerous, illus., inland Rs 36, foreign 72s. or $10 plus postage.

Although only about 0·28% of the total cultivated area in India is under tobacco, this amounts to some 900,000 areas, yielding an average of over 600 million pounds each year. This crop is a major source of revenue to the Government, producing up to 500 million rupees annually by way of excise duty and also about 160 million rupees in foreign exchange, obtained from the sale of one-sixth of the crop overseas. Research on tobacco started on a small scale about 60 years ago, but a large-scale, co-ordinated effort in research, as well as in general aspects of production and marketing, only became possible after the formation of the Indian Central Tobacco Committee in 1945. This monograph bears witness to the energy with which the Committee has tackled its task over the past 15 years.

The book is divided into three parts. Part I consists of 13 chapters covering 288 pages. In addition to a general introduction these deal respectively with: soils and climate; taxonomy; morphology, anatomy, sporogenesis and embryology; cytology and cytogenetics; genetics and plant breeding; physiology; agronomy; chemistry; diseases; insect pests; methods of curing; and seed multiplication. Part II (pp. 297-361) contains 5 chapters describing the 5 main types of tobacco grown in India, namely flue-cured tobacco, bidi tobacco, cigar and cheroot tobacco, hookah tobacco and chewing and snuff tobacco. Part III (pp. 363-94) consists of a single chapter devoted to marketing, with particular emphasis on quality characteristics and grading regulations.

In a short preface the President of the Indian Central Tobacco Committee, Dr. J. S. Patel, says: "The monograph does not claim to say the last word on tobacco as met with in our country. Fifteen years is too short a period to interpret the crop in the diversity of conditions under which it is being cultivated. It is more a treatise that has emerged as a result of stock-taking in regard to our present knowledge so as to enable the chalking out of a programme for the future, and the Committee will be amply rewarded if it is deemed and used as such." In so far as this statement might be interpreted to imply that the monograph is limited in its scope and is likely to be of much interest only in India the reviewer would suggest that Dr. Patel has been altogether too modest. In actual fact the authors have drawn extensively on experience in the United States and elsewhere, both to fill in gaps in the story and to compare conditions and research results in other countries with those found in India. This broad approach, taken in conjunction with the fact that tobacco is grown and processed in so many different ways and under such a wide range of conditions in India, makes it certain that anyone interested in the crop will find much of value in the book.

It remains to add that the monograph is provided with a full subject index and with many useful lists of references. The print is large and clear and the text is embellished with numerous photographs. G.K.A.

5558. MATHER, J. C.
Commercial production of tulips and daffodils.
Collingridge, London, 1961, 9½ × 6 in., pp. 212 plus 64 illus., 63s.

J. C. Mather has spent much of his career since leaving Wye College in 1938 in the advisory services of one kind or another, chiefly in the bulb growing districts of Eastern England. He has now gathered together much valuable information about the commercial production of both dry bulbs and the flowers of tulips and daffodils, the two most important bulb crops grown in this country.

The eleven chapters of the book can be divided into three sections of approximately equal length. The first nine chapters, occupying about a third of the book, deal with the history, distribution and methods of production of these two crops in Britain, the structure and life history of bulbs, their storage and the marketing of the flowers. In these chapters the author shows how well he has assimilated the intense commercial knowledge of the Lincolnshire and Norfolk bulb growers, and he provides, for established grower and newcomer alike, a useful account of modern methods in this specialist section of the horticultural industry. He is naturally less at home when discussing flower and bulb production in the South West of England, and this weakness is emphasized by the omission of some 500 acres of Scillonian daffodils from the list of bulb acreages given in an appendix on the last page and when discussing the bulb growing areas in the South West of England.

The tenth chapter consists of lists of varieties and explanations of their classification. This, with the lists of varieties elsewhere in the book, occupies another third of the book. This section is perhaps the least valuable, including as it does names of varieties which have slipped into the limbo of the past, alongside others which have still to prove their worth at least in commerce. Even so some of the most promising of the varieties are omitted. The yellow trumpet varieties of daffodil Corinthian, Dutch Master and Burgemeester Gouverneur are amongst those which might well have been mentioned in this comprehensive catalogue.

Unfortunately, too, a few of the varieties are placed in the wrong divisions as described in the classified lists published by the registration authorities.

The final chapter lists, describes and discusses all the important bulb disorders and their control. This chapter is a valuable and up-to-date account of the troubles which affect these two crops. Unfortunately it perpetuates the idea that J. K. Ramsbottom's work with the daffodil strain of stem and bulb eelworm was of secondary importance. In fact, Ramsbottom's papers in 1918 and 1919, which are not quoted in this book, opened the way to the use of the control measures which are still in use to-day.

In all, however, this rather highly priced book will be of great value to bulb growers and forcers, particularly in the colder eastern parts of Britain, and to the general horticultural adviser who has little close contact with this intensive section of the industry. It will also give much valuable information to students of horticulture of all kinds, and to the keen gardener it will tell how his bulbs are produced and give useful hints as to how they should be treated in health and disease.

F.W.S.

5559. OCHSE, J. J., AND OTHERS.
Tropical and subtropical agriculture.
Macmillan, New York, 1961, 8½ × 5½ in., in 2 vols, pp. liv + 1,446, bibls numerous, illus., $35.00.

This monumental production can hardly fail to take rank as a standard work of reference. It is advertised as "ten years preparing" and the claim is easy to accept, for the effort and the erudition that have gone into it are obvious and prodigious. The work is in two parts, which do not coincide with the volumes, Part I occupying only half the first volume or approximately a quarter of the whole. The first part, labelled "General", is described in the preface as representing "the firm belief of the writers that horticulturists or agronomists should have the broadest possible background in climatic factors, formation of soils, soil fertility, soil management, cultural practices, control of diseases and other pests, crop improvement, economic possibilities for the future, and the food value of tropical crops". These topics are treated, very unevenly, in 368 pages of which about 45 are occupied by lists of selected references. Two-thirds of the space are devoted to four chapters on soils and soil management. Control of pests and diseases gets only 4 pages, economic considerations 3, and food value 4.

Part II is in effect an encyclopaedia of tropical and subtropical crop plants, though not alphabetically arranged. To quote the preface again (because it cannot be bettered for conciseness): "The description of each crop follows a similar pattern: general information including world production, botany, botanical description, varieties, breeding and selection, climatic and soil requirements, culture, harvesting, processing, uses, and lists of diseases and other pests. Some or all of these sections have been combined in the case of minor crops. In others additional ones, such as flower biology, pollination or future possibilities, have been included. As in the general part of the book, selected references are given at the end of the chapters."

The number of pages allotted to individual major crops ranges from 17 for the coconut to 73 for rubber. Among grouped crops the citrus fruits get a rather generous 122 pages (understandable in a text written in Florida) and other fruits (excluding bananas, separately treated) get 237. This big section owes a great deal to Dr. Ochse's earlier book on fruits of the East Indies and is illustrated with many of the excellent line drawings that embellish that work. It is interesting to note that the important cereals (rice, maize and sorghum) share a chapter with sugar cane as "other field crops". The cane gets 54 pages, but rice only 18, maize 16, sorghum 11.

There are in all 285 illustrations, but the standard of reproduction of the half-tone figures is less satisfactory than that of the drawings. There are also 103 tables in the text; conversion factors for weights and measures; a glossary of botanical terms; and indexes of authors, subjects and common plant names. Some indication of the labour put into the compilation is given by the number of entries in the Author Index—roughly estimated at 1,500.

In face of so much industry it may seem ungracious, or almost impertinent, to find fault with the results. But comprehensiveness has its drawbacks as well as its advantages, and one of them is cost. At its price this is not a book for every student's shelf. Without doubting that it will be very useful to some people, one cannot help wondering whether it really is just what many prospective customers have long been wanting.

In the first place the buyer should understand that it is not, strictly speaking, a text-book of tropical agriculture. Its concern is the husbandry of cash crops, with the greatest attention given to the perennials. There is no pretence to discuss livestock husbandry, grassland, mixed farming or the problems of subsistence agriculture. This is not meant as a criticism, but as a statement of fact to prevent misunderstanding of the title.

The authors have had in mind readers that will include a student in college just beginning his career, a plantation manager or small farmer with some experience, a technician specializing in certain phases of a given crop, or an administrator whose responsibilities include land use development and evaluation of general agricultural policy. In my regretful judgment these were too many birds to kill with one stone, however heavy, and none of the targets has been squarely hit. The student in college is most narrowly missed. If his primary need is a general introduction to tropical crop husbandry he should not be obliged to buy with it an encyclopaedia of crops; but certainly if he can afford both he will have a rich mine of facts and references to assist his studies. The specialist in a given crop will usually find more information for his purposes in one of the many authoritative crop monographs that have been published in recent years. As for the farmers and administrators, my impression is that both these classes of readers would benefit more from a different selection of information and a completely different mode of presentation. However that may be, I can think of no important class of readers who would not have been equally well served if Parts I and II, which differ in appeal and potential uses, had been published separately, making each by itself less expensive.

Considering the two parts separately, I found the first less praiseworthy than the second. The ecological approach of Part I is valuable, and its subject matter sound as far as it goes. With its heavy emphasis on climate and soils it falls short of presenting a balanced picture of the problems of crop husbandry in the tropics; but that does not matter as long as the user appreciates its limitations. My chief complaint is against the presentation, which cannot be commended. Some passages seem to be written for very elementary students indeed and some for quite advanced ones. The mixture is not pleasing; and readability is further reduced by an over-meticulous citation of authorities which is a waste of space as well as a hindrance to the train of thought. In ten consecutive pages I counted 14 bracketed references to one text-book. The following extract illustrates the style at its worst: "Klages (1942) mentions that Livingston recognized, as many had previously, that vital activities of plants are not determined by one factor of environment, such as temperature, to the exclusion of all others and developed the moisture-temperature or hydro-thermal index."

There is little to criticize in Part II, if one accepts the value of having in one volume concise accounts of major crops that have been treated at greater length in text-books by acknowledged authorities. It is not to be expected that the authors should have the first-hand acquaintance with each and every crop in several parts of the tropics that is necessary for fully authoritative treatment. Occasional passages indicate an uncritical acceptance of outdated statements in the literature; but on the whole the treatments seem (to one not competent to assess more than a few of them) to be remarkably accurate and up to date.

There are a few surprising omissions, the most notable being the whole range of starchy root crops which play so important a part in indigenous agriculture. The pulses also get less than their due, only soybean and peanut being described (and those as oil crops). Legumes such as *Cajanus* and *Vigna* are mentioned only as cover crops in the chapter on soil management in Part I.

This review must conclude as it began by emphasizing that the authors have brought wide knowledge as well as great industry to their task. I have thought it fair to explain why I do not think they score full marks; but few works attempting a comprehensive cover of so wide a field do better. The book is, on the whole, a good one. It could be welcomed more warmly if it cost less.

E.E.C.

5560. REUTHER, W. (EDITOR).
Plant analysis and fertilizer problems.
American Institute of Biological Sciences, Washington 6, D.C., 1961, 9 × 6 in., pp. 454, bibls, illus., $8.00.

This volume contains the proceedings of the Third Colloquium on Plant Analysis and Fertilizer Problems held in Montreal in 1959 and provides a wide and most authoritative series of papers on many aspects of mineral nutrition, especially in connexion with the diagnosis of deficiencies by foliar and other forms of analysis. The book is divided into two sections, each with three subsections. The first part covers plant analysis and crop fertilization for deciduous fruits and vines; citrus; and row and plantation crops. It includes the following papers: Leaf analysis as a guide to the nutritional status of soft fruit crops, by C. Bould, pp. 3-15, bibl. 11; The use of foliage analysis to determine fertilizer requirements for apple orchards and some vegetable crops, by H. B. Heeney and H. Hill, pp. 16-27, bibl. 13; Interpreting the balance of nutrient-elements in leaves of fruit trees, by A. L. Kenworthy, pp. 28-43; Associations between symptoms of potassium deficiency, plant analysis, growth and yield of Concord grapes, by N. J. Shaulis, pp. 44-57, bibl. 15; Foliar analysis as an aid in interpreting fertilizer and pre-harvest drop control studies of apples, by W. D. Weeks, pp. 58-63, bibl. 4; Nutrition of fruit trees in the semi-arid regions of the Pacific Northwest, by C. G. Woodbridge, N. R. Benson and L. P. Batjer, pp. 64-73, bibl. 25; The status of present criteria for the diagnosis of nutrient conditions in citrus, by H. D. Chapman, pp. 75-106, bibl. 67; Leaf analysis as a guide to fertilization in commercial orange growing, by J. I. de Villiers and C. J. Beyers, pp. 107-19, bibl. 5; Leaf analysis and fertility control in commercial citrus production, by A. E. Willson, pp. 120-9, bibl. 15; Crop logging of sugar cane in Hawaii, by H. F. Clements, pp. 131-47, bibl. 21; Growth, production and leaf composition of the African oil palm as affected by nutritional deficiencies, by J. D. Ferwerda, pp. 148-58, bibl. 7; and Foliar diagnosis in Brazil [including coffee and sugar cane], by E. Malavolta and F. P. Gomes, pp. 180-9, bibl. 12.

The second part of the book deals with basic studies, the sub-sections covering uptake, interactions and balance of ions and plant composition; influences of mineral nutrition on organic nutrition; and influences of environment, growth and other factors on plant composition. Papers of horticultural interest include the following: Absorption and distribution of foliar applied mineral nutrients as determined with radioisotopes, by M. J. Bukovac and S. H. Wittwer, pp. 215-30, bibl. 24; Field studies on interrelationships of micronutrients and nitrogen in leaf tissue when applied as foliar sprays on citrus, by C. K. Labanauskas, W. W. Jones and T. W. Embleton, pp. 244-56, bibl. 28; Law of minimum and balanced mineral nutrition, by P. Prevot and M. Ollagnier [this includes a critique of Homes' "methode des variantes systématiques"], pp. 257-77, bibl. 17; Alimentation foliaire en bore de *Raphanus sativus* L., by M. Thellier, pp. 297-9, bibl. 1; Some factors influencing the intermediary nitrogenous compounds in leaves of the strawberry plant (*Fragaria chiloensis* var. *ananassa*), by D. Boynton, L. Yatsu and S. S. Kwong, pp. 301-13, bibl. 6; Ribonuclease as a guide for the determination of zinc deficiency in orchard trees, by B. Kessler, pp. 314-22, bibl. 11; Growth and composition of sugar cane as influenced by nitrogen, by G. O. Burr, pp. 327-37, bibl. 7; The effect of a virus disease, leafroll, on the mineral composition of grape tissue and a comparison of leafroll and potassium deficiency symptoms, by J. A. Cook and A. C. Goheen, pp. 338-54, bibl. 19; Variation pattern established by foliar analysis of vegetable plants, by F. S. Howlett, pp. 355-88, bibl. 23; The effects of growth and fruiting on leaf composition of citrus trees, by K. Satō, pp. 400-8, bibl. 10; The errors involved in the sampling of citrus and pineapple plants for leaf analysis purposes, by W. J. A. Steyn, pp. 409-30, bibl. 18; and Dependence of mineral composition of plants on environmental conditions [including work on tomatoes and cucumbers], by Z. I. Zurbicki, pp. 431-8, bibl. 5.

5561. Richards, A. A.
Tomato and cucumber culture.
Collingridge, London, 4th (revised) edition, 1960, 7½ × 5 in., pp. 128, illus., 12s. 6d.

This book was first published in 1945, but as the author died several years ago this new edition can only have been revised by others un-named. The stated object of the book is "to help the amateur and the beginner to become familiar with modern methods of tomato and cucumber production", but this it regretably fails to do. Much of the information provided is outdated and there is little or no mention of the technical advances in the cultivation of these two crops in the last ten years. In addition, the text is in some instances confusing and there are a number of errors which should not have appeared in a fourth edition. In the section dealing with tomatoes no mention is made of the John Innes seed and potting composts in the chapter dealing with this subject. Developments in heating, the effect of temperature on growth and development, automatic watering, liquid feeding and the effect of environmental factors on quality are omitted. Similarly, with cucumbers, developments in bed construction, cordon growing, rootstocks and scab resistant varieties receive no mention. In dealing with tomato varieties for cloche and outdoor production bush and dwarf types are confused. The two types are distinct, bush varieties having a determinate habit, whereas the dwarf varieties have the indeterminate habit of the glasshouse varieties, differing from them only in the shortness of their internodes.

The sections dealing with pests and diseases are more outdated than the rest of the book. Colloidal copper and Cheshunt compound are not now accepted as a control for *Didymella*, while no mention is made of captan, the most useful material against this disease. A tank mix of nabam and zinc sulphate is more effective against *Cladosporium* than the zineb formulation recommended; furthermore saponin is no longer used as a wetter. The diseases of cucumber, which are described, could well have been reduced in number to powdery mildew, gummosis, verticillium wilt and cucumber mosaic, as the others are not of economic importance to-day. Petroleum oil should always be added to colloidal copper sprays used to control mildew on cucumbers, if serious risk of damage is to be avoided. Karathane and the vapourizing of sulphur are not mentioned, but are more effective than copper against mildew. Cucumber mosaic is described as giving "fern leaf" on cucumber, but this is not so; the "fern leaf" symptoms are produced when this virus infects tomato. Root-knot eelworm is now *Meloidogyne* spp., not *Heterodera marioni*. Neither is it correct that root-knot is more common than potato root eelworm; in the north of England the latter is in fact the more common species. None of the newer acaricides for controlling red spider mite are mentioned.

The figures given for tomato production in Jersey for 1959 are incorrect, the figure of 13,000 tons should read 25,000 tons. Superphosphate contains 18% P_2O_5 not 30% as stated on p. 49. Potentate is not now the most widely grown variety; a survey in 1959 showed that Moneymaker held this position with an acreage nearly double that of Potentate. The cucumber variety Improved Telegraph is a smooth variety and not covered with innumerable spines.

It is difficult to recommend the book to horticulturalists, amateur or professional. Originally written by a man with a long experience and wide knowledge of glasshouse crops, it is regrettable that the present revision has not brought the book more up to date. G.F.S.

5562. Robinson, G. W.
The cool greenhouse.
Penguin Books, Harmondsworth, 1960, 7 × 4½ in., pp. 239, illus., 6s.

Cool does not mean cold: in this book it is assumed that the temperature of the greenhouse will not fall below 40° F. Greenhouse types, construction and methods of heating are discussed sufficiently to put the aspirant on the right track. Those who, through familiarity or because they were born knowing it all, may be tempted to skip the chapters on potting shed operations and greenhouse routine should take a second look. Quite possibly they will be surprised. A feature of the book is the description, with comprehensive notes on cultivation, of a very large number of suitable plants, many of them uncommon but all obtainable without fitting out an expedition. The more usual greenhouse plants are far from neglected, but the interpolation of unfamiliar and curious names does relieve the monotony and spur the ambition, even when *Zantedeschia* turns out to be the ordinary arum lily. G.St.C.F.

5563. Roper, L.
Hardy herbaceous plants.
Penguin Books, Harmondsworth, 1960, 7 × 4½ in., pp. 224, illus., 6s.

This is quite a rewarding book. It discusses the routine and the problems involved in the upkeep of herbaceous plants in the garden. Herbaceous borders seem to be outmoded because of "labour problems". Interpreted this means that they give a lot of work and the owner has to do it. Herbaceous plants can be employed to great effect without cramming them into borders. The author is prolific in useful suggestions for original treatments. At the end of the book, which, it should be said, is extremely well illustrated, are 16 appendices comprising lists of plants for every purpose, even for drying for winter decoration, and, one would think, for every conceivable situation. The descriptive lists of varieties of such familiar standbys as iris, delphinium or lupin might perhaps have been left to nurserymen's catalogues, which do it rather better and quote a price, but why be ungracious. It is all intended to help.
G.St.C.F.

5564. Smith, K. M.
Plant viruses.
Methuen, London, and John Wiley and Sons, New York, 3rd edition 1960, 6½ × 4 in., pp. 209, bibls numerous, illus., 16s. 6d.

The first edition of this well known book appeared in 1935 and the second in 1948. Now a third edition appears, revised and reset, which in this instance means completely re-written and greatly enlarged. The contrast between this edition and its predecessors provides striking evidence of the rapid progress that has been made in research on plant viruses during the past 25 years.

The aim of the first edition was "to bring to the notice of workers in other branches of science, and particularly botanists and entomologists, some of the more interesting and important facts of the study of plant viruses". This the author succeeded in doing in 10 short chapters totalling 95 pages, supported by 94 selected references and a subject index 2½ pages long.

The aim of the third edition is "to make it possible for a student, without previous experience, to gain some idea of the basic principles of plant virology and the means by which our knowledge has been obtained". This statement of aim may perhaps be rather misleading in so far as the term "student without previous experience" is concerned. This student is no longer the botanist or entomologist to whom virus diseases represent only one comparatively small part of his chosen field of study, but rather a student of virology, now accepted as a separate branch of science. Moreover, the student, though he may lack previous experience in virology, would certainly find a good general grounding in biological science helpful to an understanding of a subject that has been found to possess many complicated aspects. Put another way, the first edition might be said to have been written for the amateur, the third for the professional.

In its new form the book is twice as long as the first edition and the subject index and references (now placed at the end of each chapter) have also been much increased. The text has been completely re-arranged and is now divided into two parts. Part I, entitled General Survey, consists of 7 chapters covering historical aspects, symptomatology, methods of dissemination, relationships of plant viruses with their vectors, the physiology of plant virus diseases, latent virus infections in plants and the electron microscopy of plant viruses. Part II, entitled Practical Methods in Plant Virology, contains 6 chapters devoted to mechanical methods of inoculation, testing for the presence of viruses, local lesions and virus complexes, the serology of plant viruses, the purification of plant viruses and the control of plant virus diseases. An appendix lists some common viruses and their indicator plants.

The book provides, in concise and readable form, a wealth of up-to-date information on the nature of plant viruses and the methods developed for studying them. Printing and illustrations are excellent, and for these days the price is distinctly modest. G.K.A.

5565. TEUSCHER, H., AND ADLER, R.
The soil and its fertility.
Reinhold Publishing Corporation, New York, and Chapman and Hall, London, 1960, 9 × 6 in., pp. 446, 100s.

The first author of this book has been curator of the Montreal Botanic Garden since 1936, and is well known and highly esteemed for his work in horticulture. The second author, a chemist, spent the last years of his life working in his own soil laboratory. The book comprises 7 main sections, an appendix on pH, another on the mathematics of Mitscherlich's law, a glossary and an index. The main sections deal with soil composition and contents; soil physics in relation to plants; soil dynamics (including a delightful historical introduction); nutrient elements (N, P, K, Ca, S, Fe and C); manures, composts and fertilizers; the laws of soil fertility; and a summary of scientific and practical procedures. The final chapter concerns soil fertility in the garden.

K.C.

Annuals and reports.

(*See also* 4492, 4636, 4642, 4701, 4894, 4967, 4999, 5265, 5301, 5378, 5413-5415, 5417.)

5566. BRITISH SOLOMON ISLANDS.
Annual Report of the Department of Agriculture for the year 1959, [1960], pp. 21.

Extension work with coconuts, including pest control measures, is reported: cacao is a newly introduced crop which shows promise.

5567. CALIFORNIA.
40th Annual Report of the State of California Department of Agriculture, [1 July, 1958, to 30 June, 1959].
Quart. Bull. Calif. Dep. Agric., 1960, **49**: 44-175, illus.

Entomology: The Steiner and McPhail types of fruit fly trap were again used for detecting Mediterranean, melon, oriental and Mexican fruit flies; the Frick trap, using powdered ammonium carbonate lures, replaced the former types north of the Tehachapi mountains. Eradicative sprays for citrus whitefly consisted of 2 gal. light medium oil/100 gal. To control the western cherry fruit fly 1 lb. actual diazinon/100 gal. was applied at 10-day intervals. *Plant pathology:* All Meyer lemon trees were removed from certain districts to help control the spread of tristeza, and Satsuma mandarin orange trees were also tested, and removed if infected, as these are symptomless carriers of tristeza.

5568. CAWTHRON INSTITUTE.
Annual Report 1959-1960, Nelson, N.Z., 1960, pp. 35.

Fruit research: Foliar sprays of Na and K acetates increased the incidence of bitter pit in apples, but Ca decreased it. When applied to the soil as limestone, however, Ca increased pitting. *Hop research:* The greatest hop yields were produced with the application of standard fertilizer (15 cwt./acre) plus sulphate of ammonia (1 cwt./acre); no virus infection was observed in 3 new hop varieties, Calicross, First Choice and Smooth Cone, which were grafted on infected plants of the Californian variety. *Tomato research:* Variety V 548 formed fewer flowers than Potentate but a greater proportion set fruit; Potentate was more adversely affected by low temperatures than V 548, but with V 548 soil moisture levels during early growth needed more careful regulation. *Tobacco research:* The addition of sodium molybdate (1 lb./acre) increased the Mo content of the leaf seven-fold, whereas copper sulphate (25 lb./acre) only doubled the Cu content. The report also contains several special articles, which are abstracted separately.

5569. CENTRUM VOOR PLANTENFYSIOLOGISCH ONDERZOEK, WAGENINGEN.
Jaarverslag 1960. **(Annual Report of the Centre for Plant-physiological Studies, Wageningen, for 1960),** [1960], pp. 22.

Progress reports are given on the following projects: The effect of organic spray materials (dithiocarbamates) on the dormancy of tulip bulbs; interactions between shoot, fruit and root growth (graft compatibility of melon on *Cucurbita ficifolia* and graft chlorosis of cucumber on *Cucurbita ficifolia*); the degree of biochemical adaptation of tomato plants to the N source; physiology of chicory (low temperature storage of roots); the effect of K ions on salt damage to plants; the metabolism and translocation of absorbed N compounds in tomato plants; the effect of plant protection materials on leaf chlorophyll contents (including the effect of carbamates on tulip leaves); and seasonal effects on the distribution and composition of carbohydrates in tomato plants.

5570. COLONIAL PESTICIDES RESEARCH COMMITTEE.
Thirteenth Annual Report 1959-1960, 1960, pp. 234-60.

Research undertaken by the several Units, mostly of a fundamental nature, is reviewed. Other work, not under the aegis of the Committee, which is reported includes the following: *Barbados:* Dieldrin has been recommended for root borer control in sugar cane. *Kenya:* Spraying with dieldrin against the banana weevil resulted in smaller yield increases than did mulching; good control of pyrethrum thrips was achieved with 2 sprays of DDT at an interval of 10 days. *Mauritius:* Dipterex sprays gave good control of the fruit fly *Pardalaspis cyanescens* on tomato; Dimecron has given excellent control of the citrus aphid (*Toxoptera citricidus*), the tobacco leaf miner

(*Gnorimoschema operculella*) and the tobacco budworm. *Sierra Leone:* The best control of cacao black pod disease (*Phytophthora palmivora*) was obtained by spraying with carbide bordeaux once every 3 to 4 weeks. *Trinidad and Tobago:* Trithion gave good control of the citrus rust mite (*Phyllocoptruta oleivora*) and the scale insects *Chrysomphalus aonidum* and *Lepidosaphes beckii*; low volume application of copper-dithiocarbamate controlled *Septoria* spotting, and cuprous oxide gave significant control of scab on grapefruit.

5571. COMMONWEALTH INSTITUTE OF ENTOMOLOGY.
Report of the Seventh Commonwealth Entomological Conference, 6th-15th July, 1960. Commonwealth Institute of Entomology, 56 Queen's Gate, London, S.W.7, 1960, pp. 399, bibls, 50s.

The 3 major sections of this lengthy report deal with the work of the Commonwealth Institutes of Entomology and Biological Control, the proceedings of the meetings together with the texts of numerous papers delivered on many aspects of entomology, and a series of reviews of the work on economic entomology in progress in the various Commonwealth countries ranging from Aden to Zanzibar.

5572. EAST AFRICAN INDUSTRIAL RESEARCH ORGANIZATION.
Annual Report 1959-1960, 1960, pp. 15, illus., 2s.

The occurrence of onion flavour in coffee was found to be closely correlated with the presence of propionic acid in the fermentation products of the mucilage around the bean. Various methods of extracting the oil from avocado pears were examined, all of which produced a dark, impure oil. This oil could be refined economically by caustic soda and bleached with activated earth, provided that the fruit was in good condition. Mention is also made of investigations on bromelain from pineapples, cashew nut shell liquid residue and jasmine concrete production.

5573. EAST MALLING.
Annual Report of East Malling Research Station, 1960, 1961, **A44**, pp. xxiv + 148, bibls, illus., 17s. 6d. or $2.50 post free.

General review of research work (pp. 7–39). The main work in progress in each of the Research Station's 9 Sections is outlined. *Research reports and reviews* (pp. 40–122): In all 22 papers are presented in this part of the report. Most of these have been abstracted separately. In addition, attention should be drawn to the 13th Amos Memorial Lecture entitled "The plant cuticle: its structure and relation to spraying problems", by J. T. Martin. *Bulletins for fruit growers* (pp. 123–44): Five in number, these deal with: (1) Fruit growing in northern Italy (with particular reference to apples and pears), by A. P. Preston; (2) Rootstocks for plums, by E. M. Glenn, who draws attention to the merits of Myrobalan B (vigorous), Pershore Yellow Egg (medium vigour) and St. Julien A (semi-dwarfing); (3) Controlling strawberry *Botrytis* (notably by captan and thiram sprays), by M. H. Moore; (4) Progress in research on fruit crops in 1960, by B. F. Self, who highlights the main points covered in more detail in the earlier parts of the report; (5) Progress in research on *Verticillium* wilt and virus diseases of hops in 1960, by R. V. Harris.

5574. FAIRFIELD (N.A.A.S.).
First Report of Fairfield Experimental Horticulture Station, 1959, 1960, pp. 98.

This report covers the period 1950 to 1959: it is hoped to issue annual reports in the future. The first 3 sections deal with glasshouse design, construction and heating, and plant environment. *Tomatoes:* Additions to the soil of peat, sawdust, grit and straw, as alternatives to stable manure gave higher yields than the control (no conditioner), but no better than the manure. Large amounts of N, Mg and Ca were lost during the flooding of glasshouse soil after steaming, and of Ca and Mg and some N by drainage during the growing of the crop. Tomato plants receiving supplementary illumination developed more rapidly and cropped earlier than unlit plants; growth rate and yields increased with higher night temperatures, internode length was reduced and fruit quality improved. In spacing trials at 10, 14, 18 and 22 in. in the row closer spacing gave higher yields and improved quality. Ware Cross gave higher yields than 5 Channel Island varieties with which it was compared. *Lettuce:* Some control of botrytis was obtained using captan, but TCNB, alone or combined with zineb, checked growth. Illuminating lettuce seedlings increased the growth rate and hastened maturity, but the plants were more liable to botrytis infection. Later sowings matured more quickly than early sowings. Variety trials are reported. *Flower crops:* Chrysanthemums raised in pots gave the highest yield of blooms, followed by frame and soil block plants; highest yields were also obtained with cuttings struck on 10 March and planted on 28 April. Cuttings rooted in boxes and grown-on in them until planting out produced the poorest yield of 3 methods compared. Various methods of producing late chrysanthemums from summer-rooted cuttings were studied. Supplementary illumination of column-type stocks advanced flowering. Burying cyclamen corms caused later maturity and a more leafy plant; fertilization increased the number of flowers by 8–10%. *Soft fruit:* Variety trials of black currants, gooseberries, raspberries, red currants and strawberries are reported.

5575. FLORIDA.
Annual Report of Florida Agricultural Experiment Stations for the fiscal year ending June 30, 1959, pp. 415, illus.

Work in progress in the various departments, sections, branch stations and laboratories is summarized. This includes the breeding, growing, harvesting, marketing and processing of subtropical fruits, vegetables, ornamentals and tobacco. [See also numerous separate abstracts.]

5576. FUNDACIÓN SHELL, VENEZUELA.
Resumen de Actividades del Servicio Shell para el Agricultor 1959-1960. **(A summary of the activities of the Shell Service for Farmers 1959-1960),** Cagua (Aragua, Venezuela), 1960, pp. 86, illus.

Much of the work summarized here has been published in *Noticias Agrícolas, Servicio Shell para el Agricultor*, and relevant articles have been abstracted or noted in *H.A.* The topics mainly concerned are the control of pests, diseases and weeds, and vegetable variety trials. The crops include various vegetables, sugar cane, tobacco, coffee, cacao, coconuts, oil palms, citrus and gladioli. Other articles deal with sprinkler irrigation, extension and teaching services and publications. A glossary of agricultural chemicals is appended.

5577. INSTITUT FRANÇAIS DE RECHERCHES FRUITIÈRES OUTRE-MER (I.F.A.C.).
Rapport Annuel 1959. **(Annual Report of the French Institute for Overseas Fruit Research, 1959),** Paris, 1960, pp. 92.

After a short review of the work of the central departments in Paris, the report gives individual accounts of the various overseas stations. *Guinea fruit growing research centre:* The banana variety Nain proved the most productive in one trial and Grande Naine in a second. The best planting material proved to be a sett with an attached sucker 40–60 cm. in height. A single annual dressing of urea-formaldehyde gave fractionally better banana yields than other nitrogenous fertilizers, but all the artificial fertilizers tested greatly increased crops. With pineapples sulphate of ammonia proved to be the best source of N. A good deal of work was done on finding the correct dosage and method of application and noting the phytotoxic effects of Nemagon and other nematicides. *Ivory Coast section:* Here also investigations on the use of nematicides for controlling nematodes in banana plantations were carried out. *Cameroun regional station:* A combination of kudzu green manuring and NPK fertilizer gave the highest yields in a Gros Michel banana plantation. In a second experiment the largest marketable crop was obtained by a preliminary application of N, followed by the usual NPK dressing. Pineapples given growth-substance treatment at 7 months flowered uniformly, but when the treatment was applied at 12 months the effects were irregular and unfavourable. *Congo regional fruit growing station:* A combination of irrigation and NPK fertilization resulted in a marketable crop of bananas in a plantation, in which, without irrigation, the crop had been a complete failure; 2 kg. NPK per stool increased the yield by nearly 75%. *Antilles section:* For bananas a density of 2,850 plants per ha. in a quincunx arrangement proved best. *Corsican citrus experimental station:* The planting of this new station with citrus, avocado, pecan and pistachio continued.

5578. KENTUCKY.
Results of Research in 1959 by the Agricultural Experiment Station of the University of Kentucky, being ***72nd Annual Report,*** 1960, pp. 87.

Agricultural engineering: Direct-sown tobacco produced yields comparable to transplanted tobacco, the best emergence of coated seeds being obtained at a soil temperature of 74–78° F.; favourable soil moisture was provided by black plastic mulch. *Agronomy:* The yield of burley tobacco inoculated with etch virus was reduced by 23%; TMV in tobacco leaf mid-ribs was destroyed by treatment in 4 chambers of a re-dryer kept at temperatures of 220° F., 275° F., 275° F. and 220° F. or above. Decomposing cover crops were found to produce toxic materials that stunt or delay the growth of tobacco seedlings, and applications of strawy manure may aggravate toxicity. N, K and alkaloids in 10 burley tobacco varieties were compared; the nutrient contents of the leaf web of Burley 21 and Experimental 4 grown at 16 different fertility levels were examined. Wildfire damage was less severe on Ky 16 with higher rates of K fertilization. Annual weeds in tobacco were controlled by EPTC, 3 lb./acre 1 day after transplanting, or by Trietazine, 3 lb. just before transplanting. *Entomology and botany:* Outstanding yields were obtained from cucumbers treated with lindane, dieldrin and malathion for the control of cucumber beetles. On Tennessee Beauty strawberries control of spittlebug was obtained with Thiodan and of mites with Kelthane; high pressure, high gallonage sprays produced higher yields. Toxaphene, 2 lb./100 gal., gave effective control of mimosa webworm; phorate, Disyston and demeton, 4 lb./acre, were effective against chrysanthemum aphid; phorate and Disyston (4 lb.) and demeton (8 lb.) were also effective against mites. Insects attacking tobacco and their controls are listed, and the resistance of *Nicotiana* species to various insects is reported. TDE and endrin formulated in solvents were phytotoxic to tobacco, but endrin w.p. was not; TDE w.p. sprays produced leaf chlorosis, which disappeared in 10–14 days. *Horticulture:* Fifteen of 115 Kentucky strawberry selections were retained for further testing; strawberry rots were controlled by 4–5 applications of captan, Thylate, Cyprex or Dyrene; fertilization of Tennessee Beauty strawberries with foliar sprays of urea plus sugar produced superior crops; Tennessee Beauty strawberries were very sensitive to dust applications of β-naphthoxyacetic acid; the best weed control in strawberries was obtained with sesone (3 lb./acre), Eptam, neburon and falone. Raspberry and vegetable variety trials are reported. The use of fans in plastic greenhouses increased tomato yields; hormone sprays on Valiant tomatoes also increased total yields; clear 0·6 mil plastic laid over scattered clods of earth placed on top of black plastic considerably increased early yields. Good lettuce crops were obtained in double-layered plastic greenhouses after several cold spells as low as 10° F. Trials of 81 herbicides on 6 vegetable crops are reported. Summer fungicidal sprays of Manzate, Thylate, zineb, Cyprex, captan and Phix produced good raspberry cane growth. Apple, plum and strawberry variety trials are reported. Low-N Elberta peach trees, each receiving 7 lb. of 5–10–10 fertilizer, produced as much fruit as trees receiving a high rate of N only. A spray of Karmex diuron at 3 lb./acre gave good weed and grass control in a vineyard.

5579. LUDDINGTON (N.A.A.S.).
Report of the Luddington Experimental Horticulture Station, Stratford-on-Avon, Warwickshire, for 1959, 1960, pp. 85.

Fruit section: In spraying trials on Cox and Worcester apples 4 sprays of captan initially resulted in the largest crop of fruit, but this was subsequently reduced by mildew and red spider. Karathane w.p., 1 lb. 25% plus 4 fl. oz. 60% succinate wetter/100 gal., gave effective control of apple mildew. No phytotoxic effects, apart from some fruit drop, and no compatibility problems arose when apples were sprayed with various concentrate materials. A comparison of the performances of 8 Malling/Merton rootstocks and 2 stocks selected at Long Ashton with M.II and M.VII, using Cox and Fortune scions, is reported. Fruit size and apple tree growth increased with irrigation. Two applications of dalapon, 5 lb./100 gal./acre, controlled couch grass in cordon apples, but some regeneration occurred after rain. Trials of 2 plum scion varieties, River's Early Prolific and Cambridge Gage, on 7 rootstocks are reported. In trials to control strawberry mildew and *Botrytis* the highest yields were obtained from plots sprayed twice with thiram + Karathane, but canned and quick-frozen fruits that had been sprayed with thiram alone or combined with Karathane or lime-sulphur were tainted. Weed control in Royal Sovereign strawberry plants was obtained with a spring application of fenuron (1 lb./acre), repeated at ½ lb./acre, plus an autumn treatment (1 lb./acre). *Vegetable section:* N.I.A.B. brussels sprouts, spring cabbage and runner and climbing french bean variety trials are reported. Calomel gave the greatest club root reduction but increased yields by only 38·5% compared with aldrin which increased yields by 65%; 3 cabbage varieties showing high resistance to club root are mentioned. Monuron did not affect asparagus quality and yield. Weed control by spraying and hand weeding were compared in several vegetable crops; herbicides reduced crops of onions, spring cabbage and carrots but were effective and worth while in asparagus and parsley. The highest asparagus yields were obtained at a spacing of 4 ft. 6 in. × 12 in. Stopping brussels sprouts in mid-September gave an earlier and larger yield. Post-planting irrigation of cauliflowers produced more and larger marketable cauliflowers. Irrigation to restore the soil to field capacity before sowing was the only irrigation necessary to produce a good crop of lettuce. The yield of marketable pods and peas was increased by 1 irrigation after flowering. No browning occurred on cauliflower covered with polythene, possibly owing to a reduction in the rate of water loss from the plants. Heavy rates of dung and sewage or straw produced high yields of leeks, summer cabbage, runner beans and beetroot, but inorganic N had no effect. *Intensive cultivation section:* Variety trials of marrows are reported. Different sowing dates and planting distances of polyanthus, raised from seed, did not affect quality, but the largest number of stems for cutting resulted from July sowing; yield per plant was reduced by close spacing. *Glasshouse section:* Trials to investigate the suitability of varieties and techniques for all-year-round chrysanthemum production in different localities, and trials to encourage direct-planted chrysanthemums to flower at Christmas with minimal heating and without supplementary lighting after planting are reported. Luna, Queen of the Pinks, Valentine and Yellow Delaware are suitable varieties for Christmas pot plants. Demeton-methyl may be applied with liquid nutrient to the soil to control glasshouse red spider and aphids on chrysanthemums. *Flower section:* Early flowering and mid-season flowering chrysanthemum varieties suitable for growing in unheated glass are listed. Six plants each of 50 dahlia varieties were tested for virus infection. The germination of gypsophila seed was adversely affected by chemicals used for weed control.

5580. MADRAS.
Administration Report of the Agricultural Department for the Fasli 1368 (1st July 1958 to 30th June 1959), 1960, pp. 503, illus., 11 rupees 70 naye paise.

Research work reported includes the following: *Entomology:* Control of *Dichocrocis punctiferalis* on castor plants; biological control of the cactus cochineal (*Dactylopius tomentosus*) by *Cryptolaemus* sp.; control of various vegetable pests. *Mycology:* Studies on banana authracnose (*Gloeosporium musarum*) and fusarium wilt; control of various vegetable diseases. *Engineering:* Studies on overhead irrigation; descriptions of a hand duster and a castor bean sheller; modifications to a bark-removing machine for use on cinchona. *Castor beans:* Breeding and varieties, nutrition. *Sugar cane:* Variety trials, manuring, pest and disease control. *Horticulture:* Vine varieties and storage; citrus rootstocks and breeding; banana varieties and pre-planting treatment of suckers; apple rootstocks; dormancy breaking in plums; jackfruit rootstocks and hybridization; breeding pineapples; hybrids of *Annona* spp.; flowering and pollination of passifloras; papaya breeding; vegetable variety trials, seed storage and raising seedlings of brinjal [eggplant] and tomato; propagation of cloves, nutmegs and cacao; causes of deterioration in some imported annual seeds; and promising new introductions, including tomatoes.

5581. MINISTRY OF AGRICULTURE, LONDON.
Experiments in Horticulture in Progress at Experimental Horticulture Stations, October, 1959–September, 1960, 1960, pp. 159.

A tabulated list of N.A.A.S. projects, showing the crop, the object of the study, the place and duration of each experiment, and the treatments and varieties used.

5582. MISSISSIPPI.
73rd Annual Report of the Mississippi Agricultural Experiment Station for the fiscal year ending June 30, 1960, 1960, pp. 99, illus. Sections of the report also appear in *Miss. Fm Res.*, 1960, **23**(8): 1-8, (9): 1-7 and (10): 8, all illus.

Horticulture: The highest yielding of 10 tomato varieties were Break O'Day, Valiant and Manalucie. A plastic greenhouse with end ventilators and a fan proved superior to one with eave vents as regards the regulation of temperature and humidity. Variety and breeding trials are reported for peaches, plums, strawberries, raspberries, blackberries, grapes, apples and pears. 1 August was the most desirable "pinch" date for 3 azalea varieties. A 50:50 mixture of ammonium nitrate and potassium chloride produced better growth in chrysanthemums than fish solubles. Rose and iris variety trials are reported. *Plant pathology and physiology:* Watermelon transplants grown in pots and transplanted to the field matured 1–2 weeks earlier than plants grown directly from seed sown at the same time, and the fruits were larger. Peach scab was controlled with Puratized Apple Spray (phenyl mercury monoethanol ammonium acetate) at 2½ pt./100 gal. Thylate is recommended for petal blight control in azaleas. Breeding and variety trials with fruit and vegetables are also reported by several branch stations.

5583. NIGERIA.
Index of research: agriculture, animal husbandry, animal disease, forestry, 1959-60. Ministry of Economic Development, Lagos, [1960], pp. 48.

List of research projects undertaken by the Federal Ministry, Regional Ministries, University College, Ibadan, and numerous other Government and private organizations in Nigeria.

5584. QUEENSLAND.
Annual Report of the Department of Agriculture and Stock for the year 1959-60, 1960, pp. 126.

Agriculture: In tobacco variety trials Mammoth Delcrest, Special Virginia and Virginia Gold yielded better than Hicks, Hamilton and Golden Great; blue mould-resistant lines yielded well. Spraying guava regrowth with 2,4-D ester or 2,4,5-T resulted in root sucker development. *Horticulture:* Fertilizing pineapples by incorporating the total P and K requirements in the soil before planting and supplying N as urea sprays every 2 months was more effective than side-dressing. Temporary deficiencies of available K and Mg were thought to cause transient yellow-leaf symptoms in bananas. Marked responses to applied N were noted in papaws, and monuron gave the best weed control in this crop. Loss of viability in sweet orange seed was due to excessive drying after extraction from the fruit. Mould wastage was controlled in citrus fruit by injecting ammonia or nitrogen trichloride into the ripening rooms, but the latter delayed ripening. Fuerte, Sharwill, Nabal and Hass avocadoes produced good quality fruit and matured in succession from April to November; Wright showed promise as an early variety. A physiological disorder known as ringneck accelerated the ripening of avocadoes off the tree. The pond apple was incompatible as a stock for custard apple. Old deciduous fruit trees were more effectively thinned by DNOC sprays than young ones. Granny Smith apples picked as early as the third week in February developed severe internal discolouration during storage. Lower concentrations of DPA could be used when incorporated in mineral oil wrappers, but the DPA could not be removed from the skins by solvents. Williams' pears picked in February, stored immediately at 30° F. and subsequently at 65° F., ripened uniformly and kept long enough for canning. Late planting of strawberries produced a small plant with few crowns and a light crop. Plastic mulch was superior to tanbark mulch for strawberries, and SES treatment prior to planting suppressed weeds for 6 weeks. Maturity standards for mangoes are reported. Ginger benefited from plastic mulches. Artificial ripening of the Lady Cunningham tomato variety by temperature control and the use of ethylene accelerated, and produced more even, ripening. Severe infection of tomatoes by a disorder known as crease-stem delayed cropping and reduced yields. Bean variety 1212 carries effective resistance to angular leaf spot and may replace Redlands Beauty and Redlands Belle. Closer spacing of Enkhuizen Glory cabbage increased yields of cabbages with 3–4-lb. heads. Topweight proved the best commercial type of carrot, and Early Wonder beetroot proved a high yielding variety, the maximum yield per acre being obtained with planting in April–May. Lettuce stunt may be associated with abnormal N nutrition. Local selections of South Australian White celery yielded better than commercial seed obtained from other states. Protection of spring celery seedlings with "Windolite" was necessary to maintain temperatures above the critical bolting level of 60° F. Normal solid stowage of fruits and vegetables in fibreboard cartons resulted in a fruit pulp temperature 4–5° F. higher than in wooden cases, and fruit temperature rose by 14° F. when the cases were closely stacked and kept in the packing shed for several days. Bins holding 50–100 bu. fruit are being used to transport fruit from orchard to packing shed, and bins holding 25 bu. are used to transport apples overseas and to inter-state destinations. A telescopic fibreboard carton holding a single layer has been recommended as a commercial package for avocadoes. Packaging trials for papaws and bananas are reported. *Regional experiment stations:* Early ploughing-in of Rhodes grass prior to planting resulted in better early growth of tobacco; late ploughing-in increased nematode infection. *Botany section:* Taxonomic research for a new flora of Queensland is reported. *Plant pathology:* Zineb plus benzyl salicylate gave the best control of blue mould in tobacco. One or 2 weekly applications of captan from 1 month before harvest significantly reduced brown rot in deciduous fruits. Cuprous oxide, copper oxychloride and zineb controlled black spot in citrus. A 50% increase in strawberry yield was produced with fortnightly sprays of captan (2 lb. 50%/100 gal.), which controlled grey mould and gloeosporium fruit rot. Economical control of cercospora leaf spot and leaf speckle in bananas has been obtained by spraying with air-blast machines (50–60 gal./acre). A tomato line, Q2 × C2 hybrid, showed much promise in the field against fusarium wilt and target spot. *Plant nutrition:* Leaves of tobacco plants irrigated by furrows in alternate rows and those of rain-grown crops were lower in chlorides than the leaves of plants watered by the normal furrow technique or by sprinklers; tobacco plants also absorbed Br up to 1% of their total dry weight when seed-beds were treated with methyl bromide.

5585. ROTHAMSTED (LAWES AGRICULTURAL TRUST). ***Report of the Rothamsted Experimental Station for 1959***, Harpenden, 1960, pp. 288, bibls, 10s.

Botany department: A modified technique for assaying leaf growth-substance content is described. Studies are reported on leaf expansion as affected by the interaction of light with gibberellic acid or with kinetin, the effects of fluorescent and incandescent light on the growth of tobacco, peas, broad-, french- and runner beans, and the effects of IAA, NAA, kinetin and the type of lighting on root formation in severed bean hypocotyls. The high P content of crown gall tumours induced in *Datura stramonium* was noted. *Biochemistry department:* Improvements are reported in the technique of extracting edible protein from leaves, and the use of turnip tops and *Chenopodium amaranticolor* as new sources. Mitochondrial studies were made on tobacco leaves. *Plant pathology department:* The biochemistry of tobacco rattle virus was studied. Studies are reported on soil-borne viruses and nematode vectors, and on the aphid vectors of carrot motley dwarf virus. Control measures for cabbage and mustard clubroot with the gluconic acid complexes of copper, zinc and cobalt, and of *Fusarium* wilt in peas are reported. *Nematology department:* Trials were made of new nematicides against chrysanthemum nematodes (*Aphelenchoides ritzema-bosi*), and investigations were carried out on a carrot "sickness" of possible nematodal origin.

5586. SEYCHELLES. ***Annual Report of the Department of Agriculture for the year 1959***, 1960, pp. 34, Rs. 3.

The coconut, cinnamon, vanilla and patchouli industries are reviewed. A new treatment for combating the coconut borer, *Melittomma insulare*, which consists of cleaning out the rotting tissues and painting with a mixture of creosote and tar, showed promise. The introduction of the African barn owl to control rats in coconut groves seems to be successful.

5587. SIERRE LEONE. ***Report of the Department of Agriculture for 1957***, 1959, pp. 42, 3s. 6d.

Bacterial wilt of tomatoes was found to be spread by soil micro-organisms and not to be dependent on the presence of nematodes. Lettuce plants protected from heavy rain by thick polythene sheets were 3 times the weight of unprotected plants. Stem borer of cacao was checked by painting the stems and main branches with DDT; black pod disease of cacao was suppressed by a 1% carbide bordeaux mixture. Dieldrin (1 oz./plant) controlled termites in coconuts.

5588. TUNISIA, SECRETARIAT D'ÉTAT À L'AGRICULTURE.
Rapport d'activité et d'expérimentation en défense des cultures en 1959. No. 4. **(Report on activities and experiments on crop protection in Tunisia in 1959, No. 4)**, 1960, pp. 93.

Includes papers on the control of diseases and pests of fruit and vegetables, which have been abstracted separately.

5589. TYSSER, H. F. (EDITOR).
The Fruit Annual, 1961.
British-Continental Trade Press, Ltd., 222 Strand, London, 1961, 10 × 6½ in., pp. 619, £1 post free.

The information presented in this book is possibly of more interest to fruit merchants than to growers, for it contains a world survey of production in the major fruit areas, giving names and addresses of firms engaged in all branches of the fruit trade. Another useful section of the book gives details of all commercial fruits and commonly-grown varieties, and trade journals from 16 countries are listed.

5590. UNION OF SOUTH AFRICA.
Agricultural Research, Vols. 1-3.
Project Ser. Dep. agric. tech. Serv. **1960/1-6**, 1960, pp. 505.

This report on current research, including horticultural studies, is not for publication. The sections consist of progress reports written in Afrikaans or English, but with English indexes and lists of projects.

5591. WESTERN CANADIAN SOCIETY FOR HORTICULTURE.
Report of the Proceedings of the Fourteenth Annual Meeting of the Western Canadian Society for Horticulture 1958, Banff, Alberta, 1958, pp. 86.

Among the subjects covered are the following: shelterbelt programmes, fruit breeding (including apple seedling selection and evaluation, chlorosis resistance in apples), control of chlorosis in strawberries, grafting and budding of the chief rootstocks for plums, propagation of ornamentals (including temperature treatment to induce germination of seeds of *Viburnum trilobum*, and raising *Betula* from seed), breeding ornamentals (including controlled pollination techniques for conifers, and producing vigorous *Caragana* for field shelter belts), the production of poinsettias for Christmas, the evaluation of 9 tomato varieties in the prairies, and seedling blight of peas.

5592. WEST OF SCOTLAND AGRICULTURAL COLLEGE.
Report of the Work of the College for the year ended 30 September, 1960, 1960, pp. 91.

Horticulture: Tomatoes are being bred for resistance to leaf mould fungus by crossing with *L. peruvianum*. Variety trials and a trial to compare stem and root cuttings of chrysanthemums are reported. Shading induced early flowering in chrysanthemums, and cuttings taken in late spring and stored in a refrigerator for 3–4 weeks rooted normally in July. A trial of 7 raspberry varieties, which had been heat-treated to reduce or eliminate virus diseases, is reported. Simazine and atrazine showed promise for weed control in daffodils and tulips. *Plant pathology:* Mercury compounds gave the most promising control of club-root in turnips.

5593. WISCONSIN.
What's new in farm science? being ***Parts 1*** and ***2 76th A.R. Wis. agric. Exp. Stat.*** or *Bulls* **545** and **547**, 1960, pp. 79 and 80, illus.

Red Delicious apple trees, sprayed with lead arsenate, DDT and TDE, bore apples with a better flavour, better flesh colour and higher sugar content than unsprayed trees. Sevin sprays caused the fruit to have firmer flesh at harvest and also after 3 months' storage, diazinon improved flavour, Guthion increased sugar content, malathion caused yellower flesh and poorer flavour, and Cyprex, Orthocide, glyodin and ferbam had effects on flavour which varied with variety. Cherry stones were found to contain about 6% of an oil similar to corn oil and 4·5% N as crude protein, and uses are being sought. Undesirable flavours in canned vegetables caused by a derivative of glutamine may be avoided by selecting varieties with a low level of this amino acid. Malathion, parathion or diazinon sprays in the dormant season controlled the eye-spotted bud moth on cherries; additional post-harvest sprays may be needed for severe infestations. Monuron at 10 lb./acre or diuron sprayed round the bases of mature apple trees controlled all vegetation and prevented mouse damage without harming the tree; a ground spray of endrin controlled apple maggots, plum curculios and orchard mice for 2 years. Earlidawn and Sparkle strawberry varieties are recommended for sandy irrigated soils. Badger Savoy, Wisconsin Bloomsdale and Savoy Supreme are new varieties of spinach resistant to bolting and blue mould disease. Trietazine showed promise as a weed-killer in carrots at 6 lb./acre; NPA worked into the soil 1 week before planting gave good control of weeds in cucumbers; a mid-May application of Alanap controlled crabgrass in lawns. Hormone materials extracted from plants have induced earlier blossoming in a range of ornamentals.

New periodicals.

5594. PORTUGAL, MISSÃO DE ESTUDOS AGRONÓMICOS DO ULTRAMAR.
Estudos Agronómicos. [*Estud. agron., Lisboa*], 1960, Vol. 1, No. 1, 11½ × 8 in., pp. 81, bibls, maps, Missão de Estudos Agronómicos do Ultramar, Rua da Fonseca, 103, 4°, Lisboa-1, Portugal.

This journal is to consist mainly of papers describing work carried out by the Portuguese Overseas Mission for Agricultural Studies, and will appear quarterly, in addition to the already established *Garcia de Orta.* It is intended for free distribution and exchange, but not for sale. In this first issue there are 2 articles concerning cashew nuts and prospects of cacao growing in São Tomé and Príncipe islands.

5595. TAMAGAWA UNIVERSITY.
Bulletin of the Faculty of Agriculture, Tamagawa University. [*Bull. Fac. Agric. Tamagawa*], 1960, No. 1, 10 × 7 in., pp. 134, illus., Tamagawa University, Machida City, Tokyo, Japan.

This new journal is to be an annual publication. Two of the papers included in the first number are written in English, the remainder being in Japanese with English summaries. The subjects covered range from bee and poultry husbandry to vegetable breeding. Paper and printing are good with clear illustrations. Two articles have been abstracted separately.